EXCAVATING ENGINEER

FOUNDED 1905

Bradley Mining Co. quicksilver mine at Mercury, California. The dumptor spots in close for a short swing under a 1½—yard shovel.

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April 1943

What is the Most Important Part of an Excavator?

● It is none of these and it's all of them.

There is no most important part. Every assembly, every smallest unit has its job to do. A loose bolt unattended to, a squealing band ignored, can easily result in complete stoppage of the machine.

That's why intelligent, preventive maintenance is so vitally necessary to keep your excavator digging at top speed all day long, day after day.

Careful inspection should be a regular routine. At least every six shifts (oftener in tough digging) inspect your machine completely. Be sure all nuts and cap-screws are tight.

Follow carefully your manufacturer's recommendations for care and maintenance. Lubricate regularly in accordance with instructions. Use only good lubricants. Keep oil and grease and fittings free from dirt or grit.

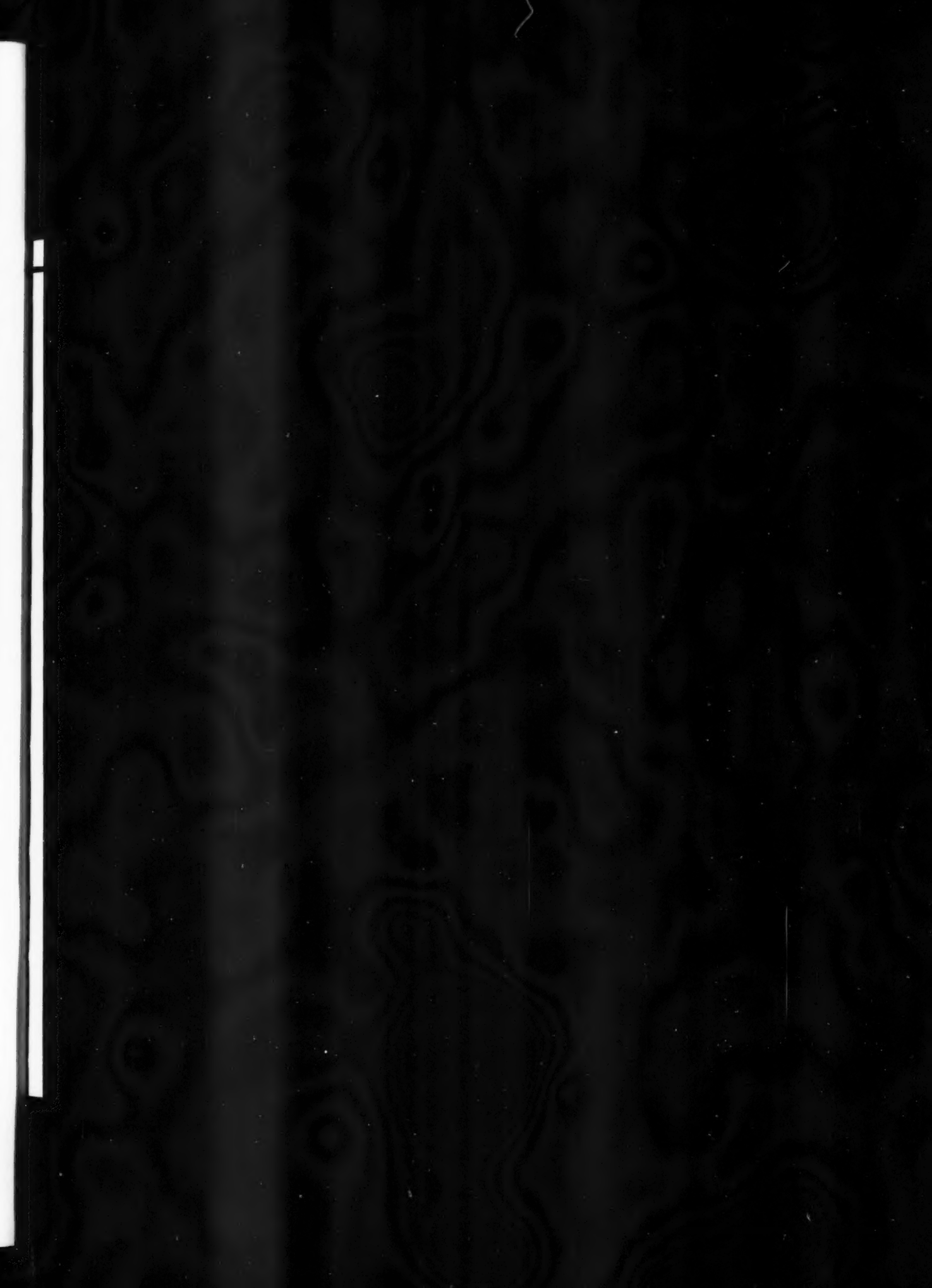
Watch the little things. Anticipate troubles; don't wait until they arise. Keep machine clean so you can see trouble start.

Time is precious. Your excavator has important work to do in this war we're fighting. Make sure it is kept in tip top fighting condition by giving it the best possible care constantly.

Bucyrus-Erie employees have accepted the award of the Army-Navy "E" as a challenge to keep production rising. ★ ★

Bucyrus-Erie

SOUTH MILWAUKEE • WISCONSIN • U. S. A.



EXCAVATING ENGINEER

FOUNDED 1905

contents

Vol. XXXVII **April, 1943** No. 4

April Advertisers

Allis-Chalmers Manufacturing Company 181
American Chain & Cable Co. .....3rd Cover
American Steel & Wire Company 191
Baker Manufacturing Company 193
Barber-Greene 164
Buckeye Traction Ditcher Co.. 165
Bucyrus-Erie Company...2nd Cover, 169, 195, 200, 203, 204
Buda Company, The 167
Caterpillar Tractor Company.. 199
Cleveland Diesel Engine Division 185
Columbia Steel Company 191
Detroit Diesel Engine Division. 185
Ensign-Bickford Company, The. 205
Euclid Road Machinery Co., The 197
For Sale (Classified) 216
Gatke Corporation 188
General Electric Company 207
Haiss Manufacturing Company, George 168
Hayward Company, The 204
Independent Pneumatic Tool Company 204
Ingersoll-Rand Company 166
International Harvester Company 211
Jahn Company, C. R. 214
Koehring Company .....4th Cover
Leschen & Sons Rope Co., A. .. 202
LeTourneau, Inc., R. G. 179
Linn Manufacturing Corp. 194
Macwhyte Company 183
Northwest Engineering Company 209
Owen Bucket Company 194
Rogers Brothers Corporation .. 198
Sauerman Brothers 190
Standard Oil Company of California 213
Templeton, Kenly & Co. 190
Timken Roller Bearing Company, The 215
Union Wire Rope Corporation.. 161
United States Steel Corp. Subsidiaries 191
Universal Engineering Corp. ... 201
Ward LaFrance Division 187
Wellman Engineering Co., The. 192
Westinghouse Electric & Manufacturing Company 162

Sand of Modern Times 170

Quarrying 546,660 tons of crude sand especially adaptable for foundries enables the American Silica-Sand Company to play an important part in the all-out war materials production needed to shorten the period of time before the defeat of the Axis.

Operating Efficiency of Power Shovels—By C. E. Stiehl ... 174

Functional operation of shovels must be properly coordinated to give best results in any excavation work. Complete understanding of shovel is necessary to obtain most effective work.

Progress on the Oregon Trail 176

Construction of Shasta Dam necessitates relocation of modern concrete highway, U. S. 99, and railroad formerly on path of historic Oregon Trail in California's Central Valley region.

Field Notes 182

Taking Kinks Out of Wire. 182
Casting Lugs on Ends of Wire Rope 182
Old Rubber Heel Handy ... 182

Shots from the Firing Line 184

Release 1,532 Vehicles Under Truck Rationing 184
Fluorspar Industry Again Establishes New Record.. 184
ARBA Finds Post-war Economy Demands Program . 184
Brazilian Iron Ore May Help Allies 186
In Memoriam—Dr. C. H. Krause 186
Complete General Plans for Brooklyn-Staten Island Tunnel 188
A. G. C. Board Meeting ... 188
Florida Road Department Adopts Construction Budget 192
Construction Contracts Increase 194
Start Engineering Work on Post-war Highways 194
Krug Named in Charge of WPB Materials Distribution 198
President Approves Columbia Basin Project Act ... 198
New England Coal Requirements 200
Schedule Access Roads to Mines and Quarries 200
Make Plans Now for Express Highways of Future 200
Fennelly Directs Program of WPB Materials Distribution 202

Ex Laffs 189

Not in the Contract 196

Notes from the Manufacturers 214

New Trade Literature 214

Published Monthly by THE EXCAVATING ENGINEER PUBLISHING COMPANY, South Milwaukee, Wisconsin, U.S.A.

F. O. WYSE, *Publisher* — ARNOLD ANDREWS, *Consulting Editor*
D. B. REED, JR., *Managing Editor* — M. J. BARGENQUEST, *Editor*
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CCA Member Controlled Circulation Audit

Regular subscription: 25 cents per copy, $2.50 a year; Canada, subject to publication policy, $3.50 per year. Special subscription: Upon written request on company letterhead, this publication will be sent frequently (not regularly) free of charge, to companies, executives and supervisors engaged actively in the industry of excavation.

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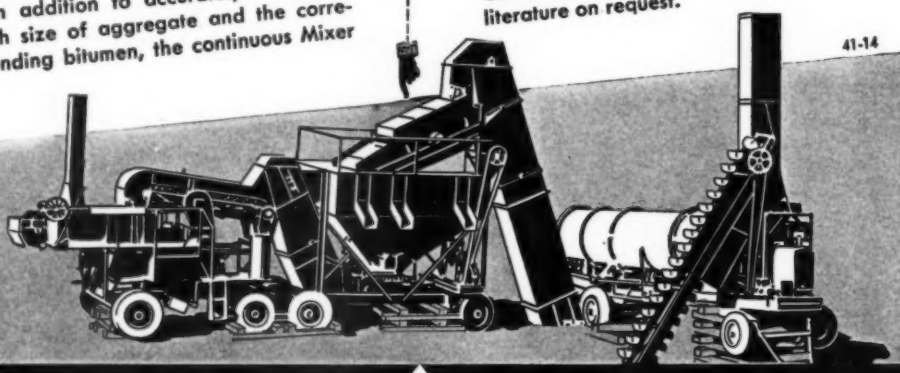

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AURORA ILLINOIS

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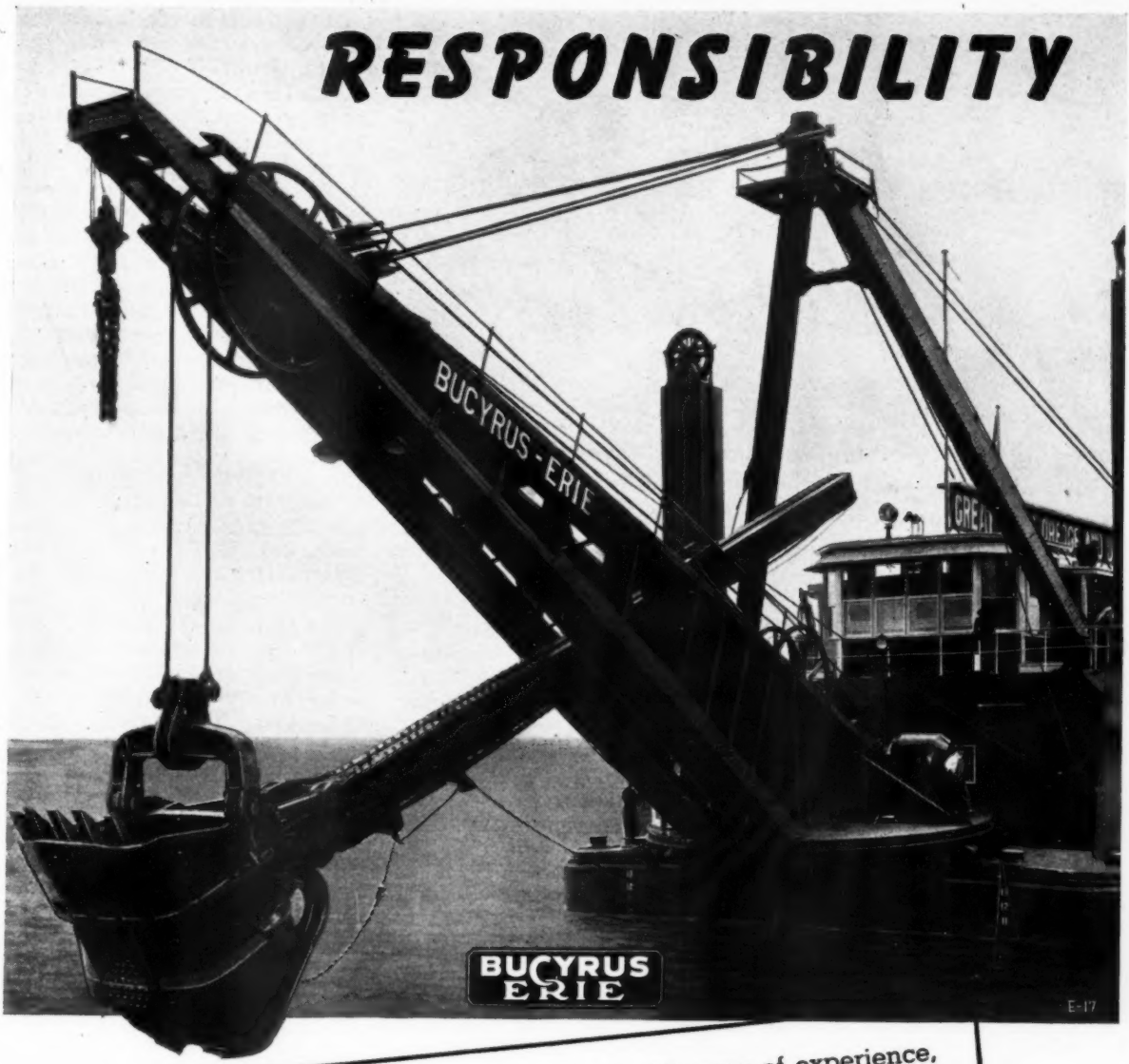

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ARMY E NAVY

Bucyrus-Erie employees have accepted the award of the Army-Navy "E" as a challenge to keep production rising. ★ ★

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For your convenience in writing to Bucyrus-Erie Company, you will find a card bound in this issue.

SAND of Modern Times

Quarrying of 546,660 tons of crude sand especially adaptable for foundaries enables the American Silica-Sand Company to play an important part in the all-out war materials production needed to shorten the period of time before the defeat of the Axis

SAND, USED to measure time in the hourglasses of ancient days, may again in this modern age be used to measure time —the production hours that we can eliminate in our efforts for ultimate victory over the Axis. Sand plays its part in the all-out production of war materials that are used to shorten the period of strife before our return to peace and to comfort in the knowledge that the dangers from the Axis nations to our liberty and lives are ended.

The American Silica-Sand Company of Ottawa, Illinois, is one of the leaders in the production of crude sand especially adaptable for foundries. This company, owning approximately 728 acres of crude silica sand, and operating three separate units producing seven grades of crude silica sand from outcrops of the St. Peters sandstone in northern Illinois, quarried 546,660 tons in 1942. The units are very flexible and the company is in a position to increase yearly tonnage by at least 300,000 tons if monthly shipments were on an average basis from March 1 to December 1. The company could, if necessary, increase its shipments by 150,000 tons during the months of August, September, October, and November, the heaviest producing months because of winter storage requirements of the company's customers. At the present time The American Silica-Sand Company is constructing a new pit which will, when completed, increase production at least 15 per cent.

Crushed and screened crude silica sand produced by The American Silica-Sand Company is used in the production of molds, cores, furnace bottoms, ladles, cupolas, runners, and many other purposes in the steel and gray iron industries.

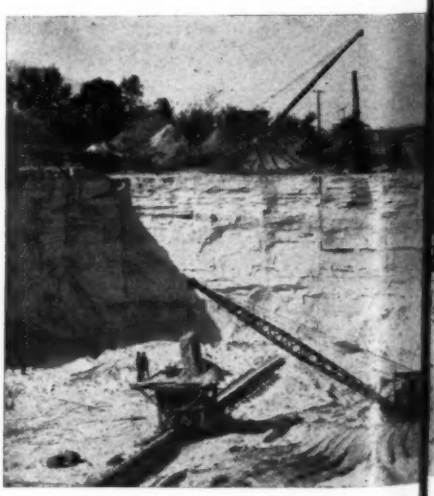
St. Peters sand is especially adapted for foundry use for two principle reasons: it has a high sintering point, 2,766 degrees F., and the rounded structure of the grain assures better permeability, the property which allows the venting of gases in the mold when steel is poured. Ordinary sand is angular in grain structure and has a sintering point too low for the higher temperatures encountered in molten steel.

St. Peters sandstone formation is practically pure silica with a small percentage of clay as the only deleterious material. The small amounts of clay present in the sand is augmented at the foundries by additions of bentonite, molasses and flour to supply the proper bond. The origin of this St. Peters sandstone has long been an interesting geological problem. There are two major theories as to the origin of the St. Peters sandstone advanced by geologists. One school explains the formation as having been a great desert of drifting sand before burial, and the other theory advanced is that the formation is a sedimentary deposit, essentially marine in origin.

Operate Three Units

The three units operated by the company are the Ottawa, Reynolds, and Higby Canyon pits. The Ottawa, largest of the three pits, is 226 acres and produces one grade of sand. The Reynolds and Higby Canyon pits each produce three grades of silica sand and are 154 acres and 146 acres in size, respectively. The product is graded by mining from certain levels of silica formation in these pits. Charles J. Niesen, president of the company, states that he feels that American Silica-Sand has a grade for every steel foundry purpose and to approximate American Foundry Association analysis.

The American Silica-Sand Company, as a consolidation of approximately 90% of the crude silica sand producers in the Utica, Ottawa, Illinois, crude silica sand field, was incorporated for $1,000,000 March 1, 1931 under the laws of the State of Delaware. In addi-



• Left: Sand is loaded into a hopper at the end of a field conveyor by a Bucyrus-Erie 33-B 1½-yard diesel dragline in the Reynolds Pit. Working at the top of the pit are a Bucyrus-Erie 30-B 1-yard dragline and an Armstrong electric driven blast hole drill. Right: A Marion 371 1¾-yard gas shovel loads 5-yard 36-inch gauge two-way Western dump cars towed by a Plymouth gas locomotive at the Higby Canyon Pit, third of three units operated by American Silica-Sand Company.

• General view of the Ottawa Pit where production averages 2,000 tons per eight hours. Stripping overburden is a 2-yard Marion diesel dragline. At the left a Bucyrus-Erie 22-T drill puts down blast holes. In the center a 1½-yard Marion diesel shovel loads silica sand into cars.

tion to President Niesen, the executive personnel of the company includes: Arthur S. Hindman, vice president and sales manager; G. A. Coble, secretary and treasurer; E. J. Madden, assistant secretary and treasurer and traffic manager; and John W. Waters, superintendent.

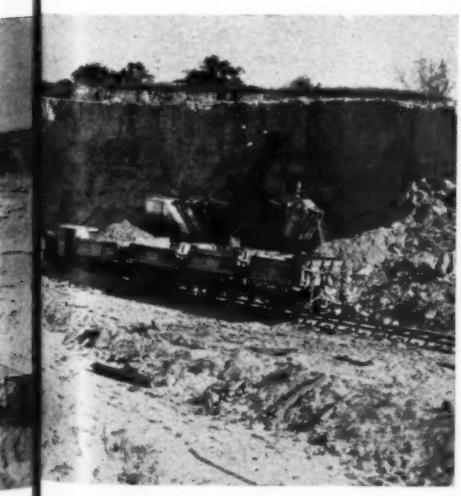
The product of this company is shipped by railroad in gondolas and box cars and also by water via the Great Lakes to Canadian and eastern points in the United States and through the Great Lakes to gulf waters via the Illinois River.

All properties of the company have been for many years proven by the core drill method.

The Ottawa Pit, largest of the three operated by the company, has an average depth of overburden of 14 feet and a maximum depth of 20 feet. The average depth of the rock is 70 feet with a maximum depth of 118 feet. There has been approximately 25,000 yards already stripped in the development of the Ottawa Pit. The production rate of the Ottawa Pit averages 32 cars or 2,000 tons in eight hours with a maximum of 40 cars or 2,500 tons in ten hours.

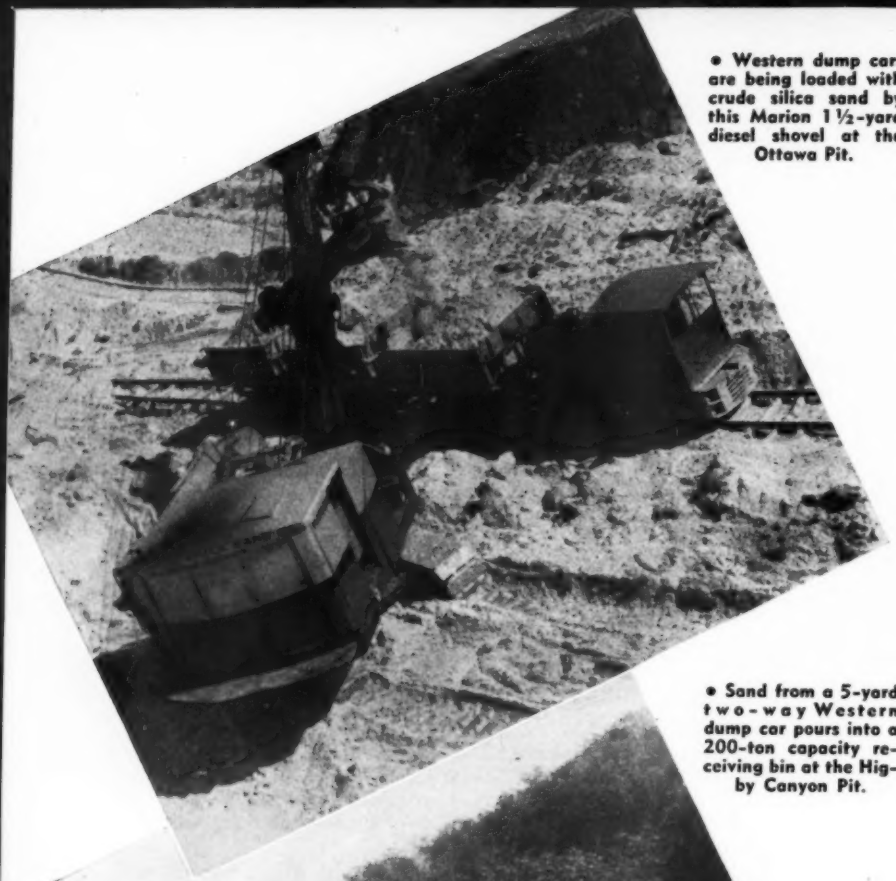
Equipment at Ottawa Pit

Included in the equipment for the production of sand from the Ottawa Pit are: a Bucyrus-Erie 22-T crawler-mounted blast hole drill; two Ingersoll-Rand jackhammer air drills; one Chicago Pneumatic air drill; one 2-yard Marion diesel dragline; one 1½-yard Marion diesel shovel; one 12-ton Plymouth gas locomotive; one 12-ton Whitcomb gas locomotive; twelve 5-yard Western dump cars; one 36-inch jaw crusher; two 27" x 30" double roll crushers; two Universal vibrating screens; two Manufacturer's Equipment Company piano wire vibrating screens; two 36-inch conveyors; one 30-inch conveyor; two Robins metal feeders; one Stephens-Adamson Manufacturing Company car puller, and various motors and other necessary production and loading equipment.

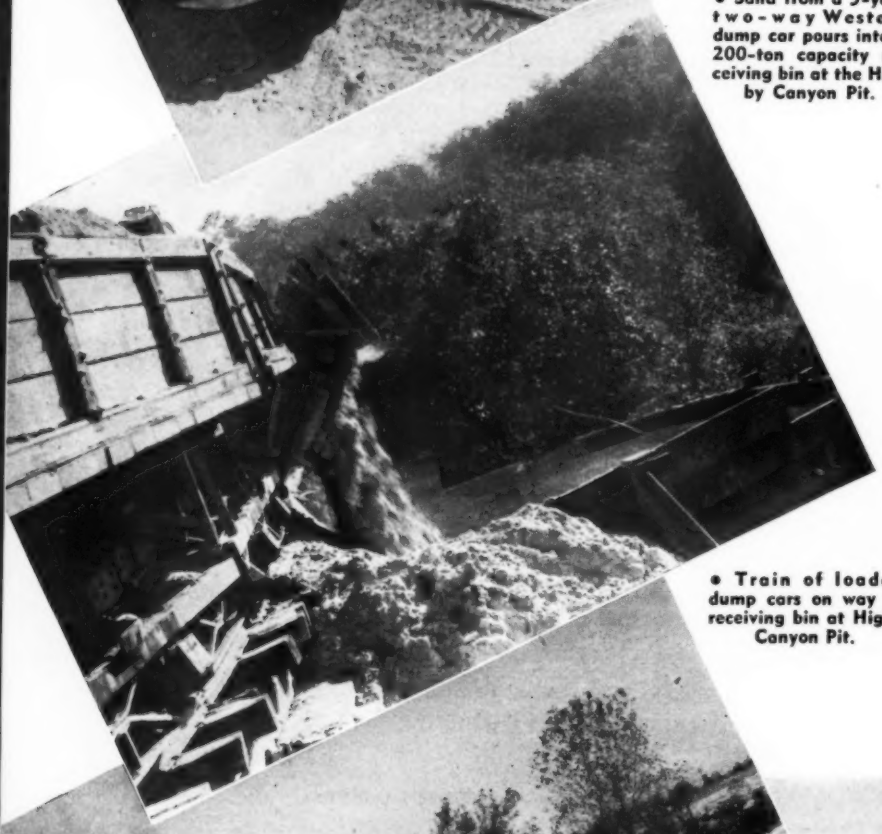


After blasting, with du Pont's dynamite or Trojan powder, the explosives used in all three of the company's pits, material is loaded by a 1½-yard Marion diesel shovel to 5-yard Western two-way dump cars and transported to receiving hoppers by either a 12-ton Plymouth or 12-ton Whitcomb locomotive. One locomotive is always held in reserve. Sand is fed from a receiving hopper over a Robins feeder to a 36-inch belt conveyor and elevated to pass over six 36" x 65" gravity screens to scalp the fines, then the oversize passes to a jaw crusher while medium lumps by-pass to a 27" x 30" corrugated double roll crusher and then over two piano wire vibrating screens from which the oversizes passes through a 27" x 30" smooth double roll crusher. All scalped sand, crushed sand, and screened sand is then elevated to pass over two more vibrating screens by another 36-inch belt conveyor. The sand passing through the finish vibrating screens falls on a shuttle conveyor which loads cars either on one or two railroad tracks for continuous loading. The Stephens-Adamson electric car spotter moves the cars so they may be filled uniformly. No stockpiles are maintained as all sand is loaded directly into the cars. The small amount of oversize which passes over the finish vibrating screens is dumped as spoil. The self conveyor in the Ottawa Pit is 284 feet long and Boston, Cincinnati, and Goodrich belting is used.

The average depth of face for blast hole drilling operations in the Ottawa Pit is 70 feet and the maximum 118 feet. The 70-foot average depth of face is also the minimum depth of face mined at the present time by The American Silica-Sand Company in this pit. Six and one-half inch blast holes and two and five-eighths-inch air



• Western dump cars are being loaded with crude silica sand by this Marion 1½-yard diesel shovel at the Ottawa Pit.



• Sand from a 5-yard two-way Western dump car pours into a 200-ton capacity receiving bin at the Higby Canyon Pit.

• Train of loaded dump cars on way to receiving bin at Higby Canyon Pit.

drill holes are used in blasting operations. The pattern of these holes changes with the formation to be drilled. The blast holes average 75 feet in depth and the wagon drill holes average 18 feet. This company always drills the average which is also their maximum. Blasts are detonated at frequent intervals, about every ten days, to prevent weathering and contamination of the raw materials.

Blast hole bits are changed every 75 feet. For the air drill holes The American Silica-Sand Company uses jack bits good for about 72 feet. The jack bits are bought as required and are not resharpened. Blast hole drills are sharpened in the company's shop. From 6,000 to 18,000 tons are brought down per blast, but the ratio of the explosive to the material removed varies because of changes in formation. Secondary blasting at the Ottawa Pit is only necessary occasionally when some large rocks need breaking.

Reynolds Pit Operations

The Reynolds Pit covers an area of 154 acres and has a depth of overburden averaging three and one-half feet, with a maximum of five feet. The average depth of rock in this pit is 75 feet and the maximum depth of rock is 122 feet. Approximately 35,000 yards have already been stripped in the development of the Reynolds Pit.

The average production rate in the Reynolds Pit per 8-hour shift is 34 cars or 2,100 tons, and a

• Overburden from the company three pits is spoil-piled at co venient locations. Here, a truc dumps its load of Reynolds P overburden.

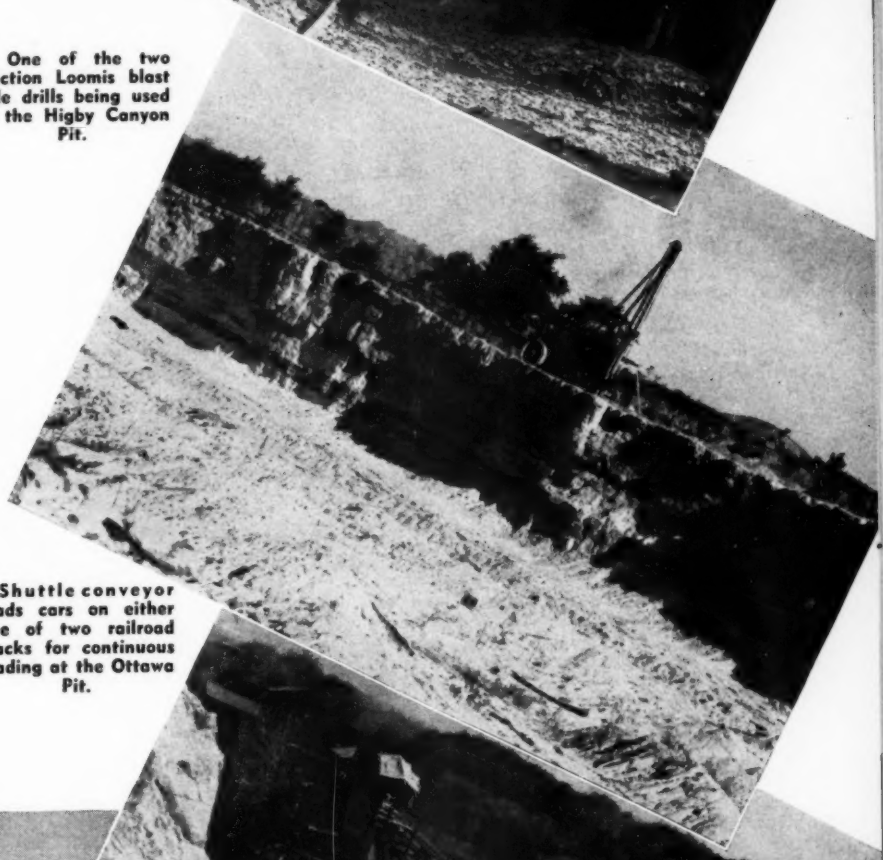
maximum of 42 cars or 2,500 tons in ten hours.

Among the drilling, loading and hauling equipment used in the Reynolds Pit are: an Armstrong electric-driven blast hole drill; a Bucyrus-Erie 30-B 1-yard diesel dragline; a Bucyrus-Erie 30-B 1-yard electric dragline; a Bucyrus-Erie 33-B 1½-yard diesel dragline; four 24-inch conveyors; one Barber-Greene feed hopper; one Robins feed hopper; one 27″ x 30″ corrugated double roll crusher; one 27″ x 30″ smooth double roll crusher; six 36″ x 60″ scalping screens; two 42″ x 96″ Universal vibrating screens; one large Manufacturer's Equipment Company box car loader, and various motors and other necessary production and loading equipment.

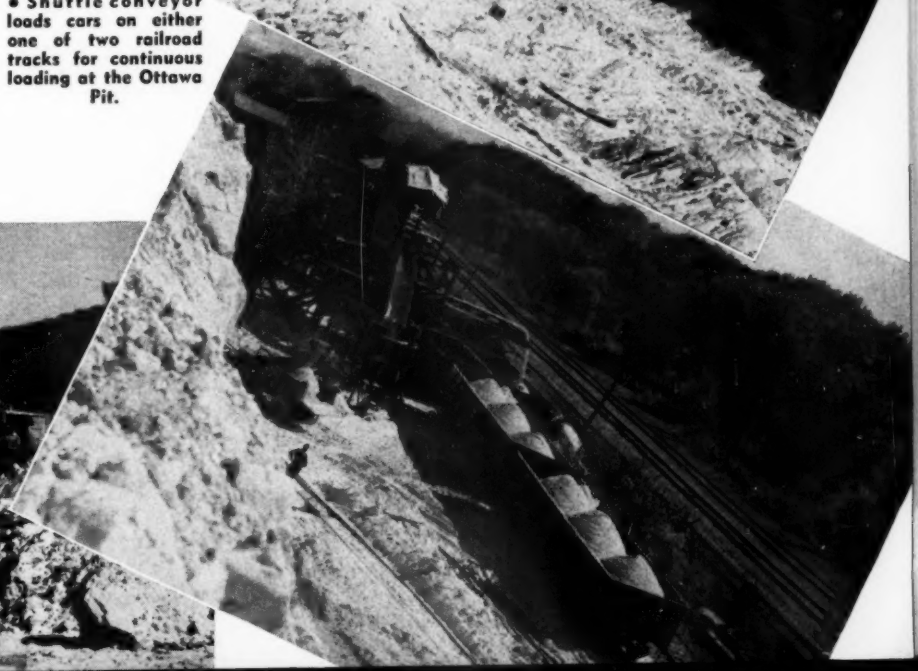
After blasting operations in the Reynolds Pit, the sand is picked up by the 33-B or 30-B Bucyrus-Erie dragline and is deposited in either the Barber-Greene or Robins feed hopper. It is then transported to the plant by three field conveyors over six scalping screens. The oversize passes through the 27″ x 30″ corrugated roll crusher and then over the two 42″ x 96″ Universal vibrating screens from which it passes through the 27″ x 30″ smooth double roll crusher and then is conveyed back over the two vibrating screens until all oversize is reduced. All sand then passes on a loading conveyor to twin elevated chutes which loads cars on either one of two tracks. If box cars are to be loaded the sand from the single chute is spouted to the hopper of the box

(Continued on page 210)

• Silica sand that has passed over scalping and vibrating screens and through roll crushers is loaded at the Higby Canyon Pit.



• One of the two traction Loomis blast hole drills being used at the Higby Canyon Pit.



• Shuttle conveyor loads cars on either one of two railroad tracks for continuous loading at the Ottawa Pit.

Dipper door of Marion 371 1¾-d gas shovel releases load into mp car while a Loomis drill puts wn holes for the next blast on bank in the background.

Operating Efficiency of Pow

Functional operations of shovels must be properly coordinated to give best results in any excavation work. Complete understanding of shovel is necessary to obtain most effective work

By C. E. STIEHL
(Bucyrus-Erie Company engineer in charge of stripping and quarry mining machines)

IN EXCAVATION WORK, whether in stripping overburden or in open pit mining, there is always a demand for increased efficiency. The efficiency of such operations means more than the individual efficiency of the three functional operations into which the work is divided. It means that these functions: (1) preparation of material to be dug; (2) excavation of the material and (3) transportation of the material, must be collectively executed with proper coordination to give the best efficiency. Their relation is one of close dependency requiring close supervision as well as good operation.

All excavation work is fundamentally the operation of digging and disposing material. The prime mover is the shovel and the efficiency of the total operation depends upon the continued operation of this tool. This fact is usually recognized, yet it is commonly found that the excavating operation has not received the complete analysis to derive the efficiency possible.

To obtain the most effective work from a shovel it is necessary to have a complete understanding of this excavating tool. It is a highly powered machine provided with perfect full control. It is well balanced in speed and power which, if properly used, is capable of high efficiency operation. To know these facts about the shovel is not sufficient for a complete knowledge of the machine. It is equally important to know its limits, to know when it is subjected to overload and to know whether the excavating conditions make it an abusive operation for a modern machinery unit.

It is invariably true that in some operations working with good efficiency, that success is due mostly to recognition of the shovel limits rather than its full accomplishments. On those operations they work on the premise and knowledge that efficiency is the ratio of output of "pay dirt" to the cost of producing it. Their operators do not overload the machine to cause delays because continued shovel operations means continued efficient production. Each operation must be planned to keep the shovel going. There is no output when the shovel is forced out of operation by poor planning, or for repairs caused by overloading and abusive operation.

There may be a difference of opinion in what the machine limits are. There are no clearly defined lines to indicate when to stop or to proceed, but there are certain known fundamental facts pertinent to any operations which, if acknowledged, will help to determine a practical limit of good operation. In easy digging the problem is, of course, simplified. But since no two jobs are alike in nature, the problems are of varied degree extending to a point of maximum when the digging is hard rock excavation where the problems are more numerous and difficult to determine a good practical limit.

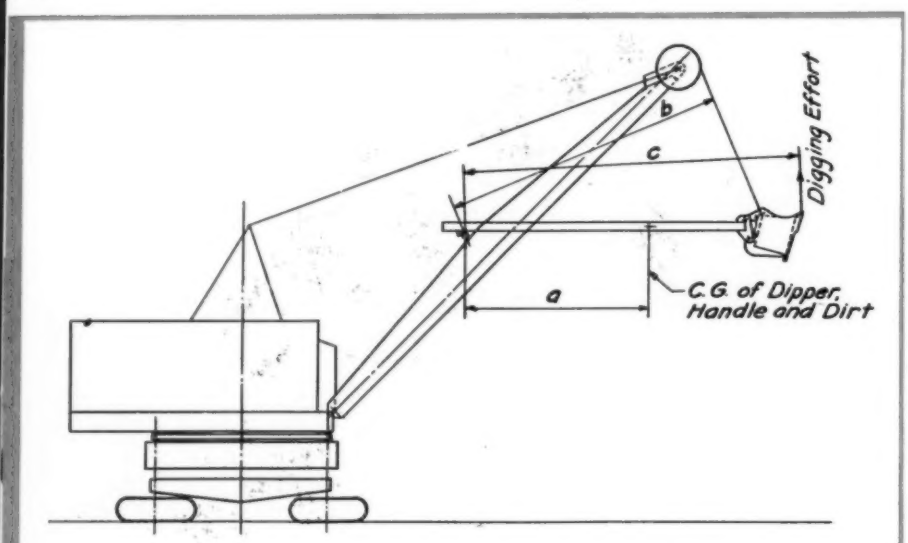


Fig. 1

Preparing and Transporting

We can start with the fundamental fact that no excavating shovel is made to dig solid or poorly blasted rock. A shovel is primarily a machine designed with a digging member or dipper equipped with digging teeth and sufficient power to force the teeth into the material along the face of the bank in order to fill the dipper with the dislodged material. Its purpose is to remove the material by filling the dipper at each pass and then disposing of it, either on a spoil pile or in trucks or cars. If the material is too hard to be penetrated with the dipper teeth, or too solid and blocky to be dislodged, it is needless to say that it must be blasted. Up to this point of analysis, everyone is surely in agreement, but where the difference of opinion arises is in the degree of blasting or preparation of the bank. The idea sometimes prevails that since the shovel is a powerful machine it is made to dig anything from

Shovels

poorly shot hard rock banks to tightly embedded rock. Also that it can be utilized in this capacity to effect a saving of explosives required for preparation work. This is false economy because the excavator is then put to a harder task of digging a difficult bank which usually results in a slower cycle, higher average loads imposed on the machine and less dipper efficiency, since it is impossible to completely fill the dipper in a tight bank. Difficult digging results in low output and high maintenance and consequently in low efficiency.

Preparation of the bank is essential and can be executed to a good balance for effective digging. This requires a study of the work. Very few jobs are of the same nature in every respect. In some cases conditions exist to limit the charge of explosives, and in others it is not advisable to shatter the bank to a dangerous looseness causing it to spill over closely located transportation facilities. In such cases secondary blasting is necessary. Large pieces or poorly blasted floors, must be prepared by secondary small charges to make their removal by the shovel efficiently possible. To persist in saving this secondary preparation work by making the operator apply stalling shovel power against solid or heavy oversize slabs of rock is costly. The fact remains that output of "pay dirt" must be maximum to get maximum efficiency and that the excavator must be kept in continuous operation. The delays and maintenance are usually more costly than the cost of more explosives to properly prepare the bank. The need for better preparation of the bank is always apparent. When the shovel maintenance costs become excessive and output drops it is time to concentrate on the preparation in the bank.

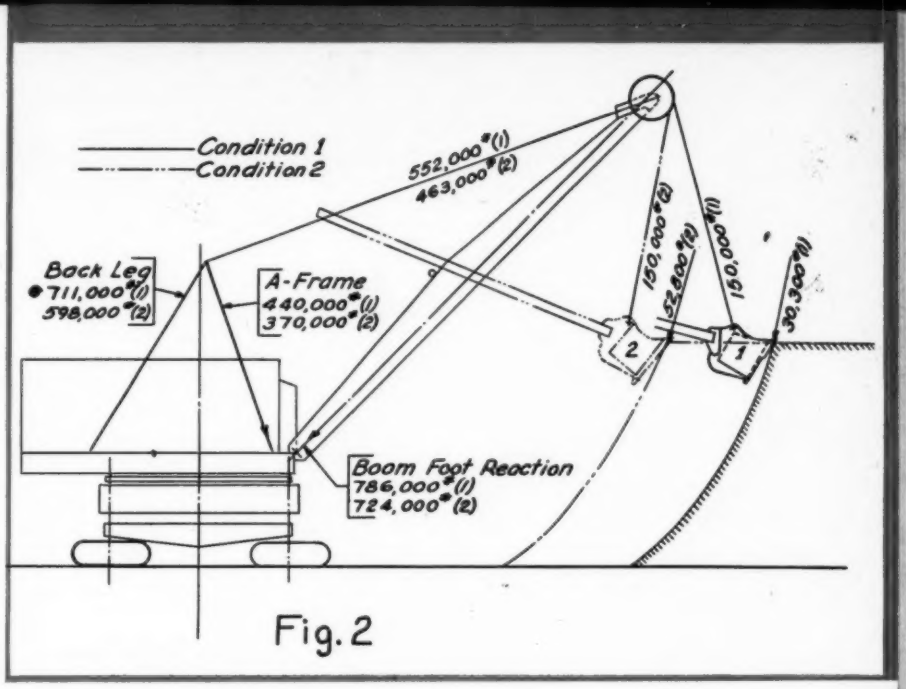


Fig. 2

The coordination of the transportation operation is less difficult. The most commonly used form of transportation is truck haulage having multiple units affording flexibility of operation. It is desirable to supply truck or rail haulage to the shovel at a uniform rate to affect uniform rate of excavation. Transportation, in a sense, sets the pace for the excavator. Should the pace be intermittent through grouping of the haulage equipment the shovel is frequently stepped up to high speed intermittent operation. In operations having good efficiency it is generally found that the shovel and haulage functions are coordinated to have a steady uniform rate.

Knowing Your Shovel

Efficient shovel operation is greatly influenced by the ability and judgment of the operator. When he is in the operator's seat he has full control of the shovel and proper operation depends upon how intelligently he utilizes the power and speed supplied on these powerful machines. Should we consider a case of breaking the shovel all the means for doing so is supplied on the machine. Each of the functions of hoist, swing and crowd are so highly powered that the destruction of the machine could be accomplished by the operator at the control. Han-

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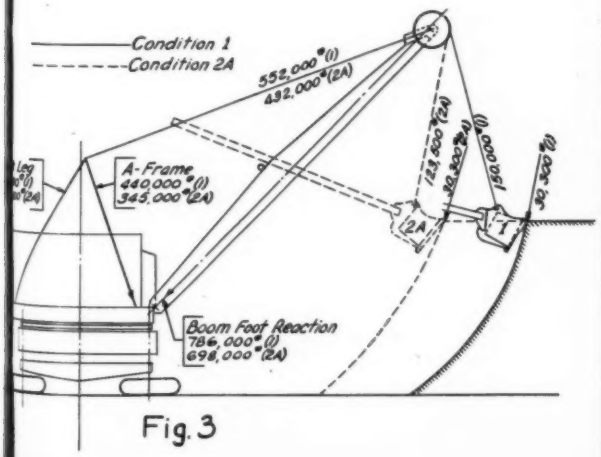


Fig. 3

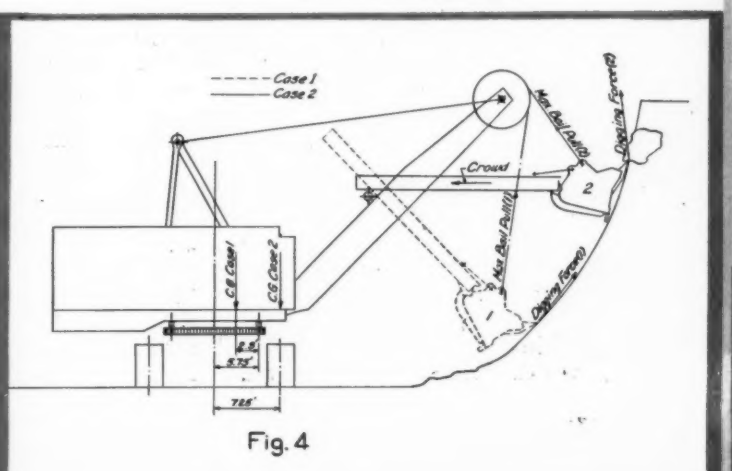


Fig. 4

• A section of the relocated U. S. Highway 99 north of Redding, California, with Shasta Dam reservoir in the valley.

Construction of Shasta Dam necessitates relocation of modern concrete highway, U. S. 99, and railroad formerly on path of historic Oregon Trail in California's Central Valley region

WHEN PIONEERS WHO came over the northern route to California on the historic Oregon Trail, following the beaten path of earlier days which led across the Siskiyous and down the Sacramento Canyon Ridge into the Sacramento Valley, they could not have possibly visioned the improvements and changes that would follow in the wake of their route which was then little more than two trails through the wilderness.

If these pioneers could have looked into a "magic crystal," they would have seen their primitive path through the wilderness become a modern concrete highway, U. S. 99. They would have seen the iron rails for the main line of the Southern Pacific Railroad laid through the Sacramento river canyon. But, probably what would have amazed them most would have been the picture of a huge dam constructed on a part of their trail which would result in a relocation of a portion of the highway and the railroad.

Interest in the Great Central Valley's water problems began with the earliest history of California as a state when in 1850 the first legislature passed a law requiring the surveyor general to prepare plans for the improvement of navigation, providing drainage, and furnishing irrigation water. This legislature adopted the common law of England which gave California the doctrine of riparian rights.

Hydraulic mining was begun on the headwaters of the Yuba and Bear rivers in 1856. The first obstruction to navigation of the Sacramento river due to hydraulic mining on its tributaries was noted at the mouth of the American river in 1860. A disastrous flood occurred in 1861. The necessity for aiding valley irrigation was recognized in 1866 by legislative approval of a bill appropriating money for a survey for a canal from the Sacramento river near Colusa to Cache Slough near Rio Vista.

California water conservation problems received early attention from the federal government. In 1873 Congress authorized the appointment by the secretary of war of a board of commissioners to make an investigation and report on the irrigation of the Sacramento, San Joaquin and Tulare valleys. The commission headed by Lt. Col. B. S. Alexander submitted a report to President U. S. Grant in 1874 which outlined a comprehensive system of "hypothetical irrigation canals," for utilizing the water resources of the Sierra streams, and recom-

mended that, "the Government, both state and national, encourage irrigation . . . particularly in the San Joaquin and Tulare valleys." The so-called Alexander report may be said to constitute the original conception of the Central Valley Project.

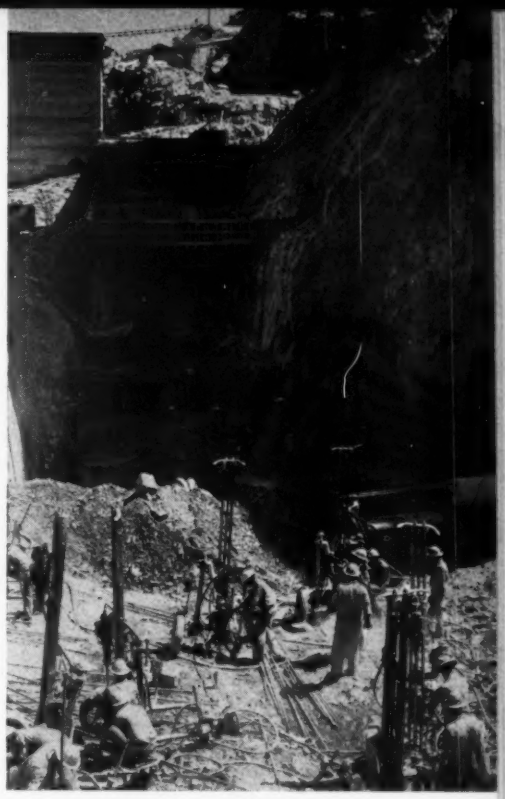
Earliest effort of the state to launch a broad study of its water resources was made in 1878 when William Ham Hall, first state engineer of California, initiated investigations under an act appropriating $100,000, "to provide a system of irrigation, promote rapid drainage and improve navigation on the Sacramento and San Joaquin rivers." Refusal of the legislature to continue apropriations stopped further work of this nature, and it was not until 1921 that the state government was to resume a comprehensive investigation of its water resources for unified development.

Plans to Restore Navigation

Meantime, the channels of the Yuba and Bear rivers became filled with debris from hydraulic mining, and adjacent agricultural lands were rapidly becoming covered with debris. In the flood of 1879, State Engineer Hall made the first flood discharge measurements. In the Sawyer decision of 1884 the United States Circuit Court prohibited further hydraulic mining, unless the mine tailings might be impounded so as to avoid injury to navigation or to private lands.

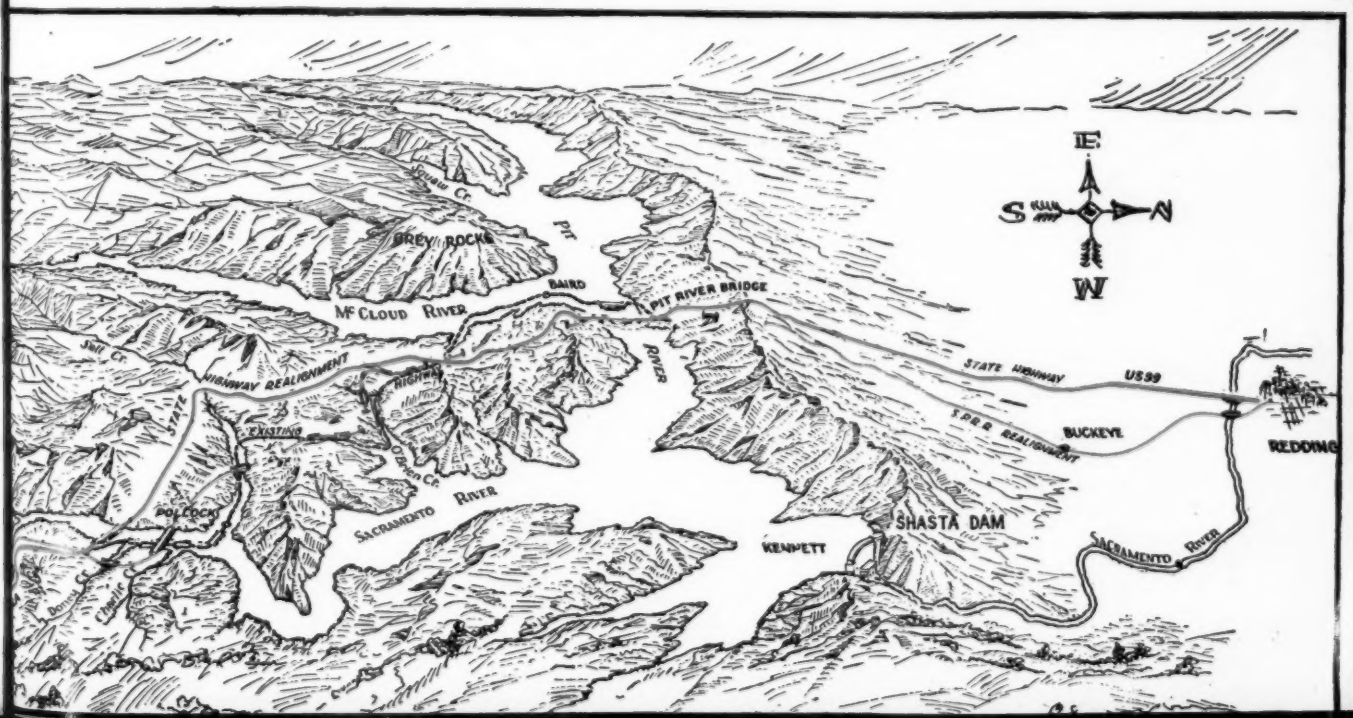
In 1887 the legislature passed the Wright Act providing for the organization of irrigation districts, and in 1893 created the California Debris commission to prepare plans for restoring the navigability of the Sacramento and San Joaquin rivers. The Debris commission's report of 1907 was followed by large floods on the Sacramento river in 1907 and 1909 before the legislature adopted the proposed flood by-pass project in 1910 and approved an emergency appropriation to meet that of the United States authorized in the Rivers and Harbors Act of June 25, 1910.

Attention of the United States bureau of reclamation was given to Central Valley water problems in several early studies and annual reports of the Department of the Interior. These included a number of Sacramento Valley investigations by Engineer Burnett and others, reports of 1902-06; a San Joaquin Valley investigation, 1905; the Orland Project on Stony Creek, first studied in 1906 and subsequently constructed by the Bureau of Reclamation; proposed Iron Canyon Project on the upper Sacramento river, 1913, and subsequent annual reports; and proposed Lower Pit River Project, report by Engineer E. G. Hopson, 1915.



• Wagon mounted drills working in river section of the Shasta Dam project.

A general program of California's stream flow measurements was started by the United States Geological Survey in the early '90's and gradually expanded until by 1919 actual measurements of stream flow were avail-



• Sketch showing routes of relocated highway and railroad around lake that will be formed by river waters behind Shasta Dam. (Sketch courtesy California Highways and Public Works.)

• This waffle-like maze of interlocking blocks is rapidly taking shape as the Bureau of Reclamation rushes work on Shasta Dam which is scheduled to be completed in January, 1944.

able on practically all the important rivers and tributaries in the Sacramento and San Joaquin basins.

A conservation project for the Great Central Valley received major impetus through the efforts of Colonel Robert Bradford Marshall who, when chief hydrographer of the Geological Survey, in a personal capacity submitted the "Marshall Plan," of coordinated development in a letter to the governor March 16, 1919. The plan, contemplating a number of storage reservoirs in major streams and a system of grand canals skirting the entire rim of the Sacramento and San Joaquin valleys, created new state-wide interest in water conservation. It encompassed the general idea of transferring surplus waters from the northerly to the southerly portion of the Central Valley. Among the reservoirs proposed was one on the Sacramento River above Redding with a dam approximately at the present site of Shasta Dam.

Central Valley Project

The act passed by the state legislature in 1921 resuming a broad study of the state's water resources, under an appropriation of $200,000, directed the state engineer to "determine a comprehensive plan for the accomplishment of the maximum conservation, control, storage, distribution and application of all of the waters of the state, and to estimate the cost of constructing dams, canals, reservoirs and other works necessary in carrying out this plan." An exhaustive report was submitted to the legislature in 1923.

The investigations were extended almost continuously under additional authorizations and appropriations of the legislature which exceeded $1,000,000, leading to the formulation of the state-wide water plan which was submitted to the legislature of 1931. The Central Valley Project, essentially in its present form, was proposed therein as the logical initial development of the long-range state-wide plan.

Meantime, irrigation and agricultural development in the Central Valley had expanded rapidly under local initiative and financing. By 1920 nearly 3,000,000 upland acres were under irrigation and more than 1,000,000 acres of swamp and overflow lands adjacent to the rivers and delta had been reclaimed with drainage works and levees. Under the impetus of the Wright Act of 1887, irrigation districts had been organized throughout the Central Valley and storage reservoirs were constructed for several of the larger systems. In addition, underground water supplies were developed extensively and used for irrigation, particularly in the southern San Joaquin Valley.

The Central Valley Project, as outlined by State Engineer Edward Hyatt, was officially adopted by the legislature of 1933 and approved by the governor on August 5, 1933. A referendum was invoked against the act, and at a special election on December 19, 1933, the Central Valley Project was approved by the people of California.

The first congressional legislation with respect to the Central Valley Project was obtained with passage of the Rivers and Harbors Act of August 30, 1935, which authorized, upon the basis of a study and recommendation of the War Department, a direct contribution of $12,000,000 of federal funds toward the construction of Shasta Dam as a recognition of navigation and flood control benefits.

The first allocation of federal funds to the project was made by President Franklin D. Roosevelt in the amount of $15,000,000 under authority of the Emergency Relief Appropriation Act which had been approved April 8, 1935. This allocation subsequently was reduced to $4,200,000.

Federal Adoption of Project

The project was declared feasible and recommended as a United States Bureau of Reclamation undertaking by Secretary of the Interior Harold L. Ickes. The feasibility report was approved by President Roosevelt on December 2, 1935, which date is the anniversary of official adoption of the project by the federal government.

Bureau of Reclamation engineers proceeded with detailed studies of the dam sites, checked the state's general plans, and prepared construction drawings and specifications for the various structures. First construction on the Central Valley Project was started February 19, 1937, at Friant on a warehouse to be a part of the government camp near the Friant Dam site. The first contract for permanent project works was awarded June 29, 1937, for the first four miles of the Contra Costa Canal. Actual construction under this contract was started October 19, 1937.

Legislation effecting a complete reauthorization of the Central Valley Project was enacted in the Rivers and Harbors Act approved August 26, 1937, giving broad powers to the Secretary of the Interior to enter into repayment contracts and acquire lands, rights-of-way, water rights and other property necessary to the project.

Shasta dam, envisioned by men who dreamed of the agricultural possibilities of this vast Central Valley region, approximately 500 miles long and 50 miles wide with an elevation running from sea level to 400 feet, was actually started with the awarding of a contract for its construction.

The Pacific Constructors, Inc., a syndicate made up of 12 companies was awarded the general contract for construction of the dam and power house for $35,239,450, not including the cost of

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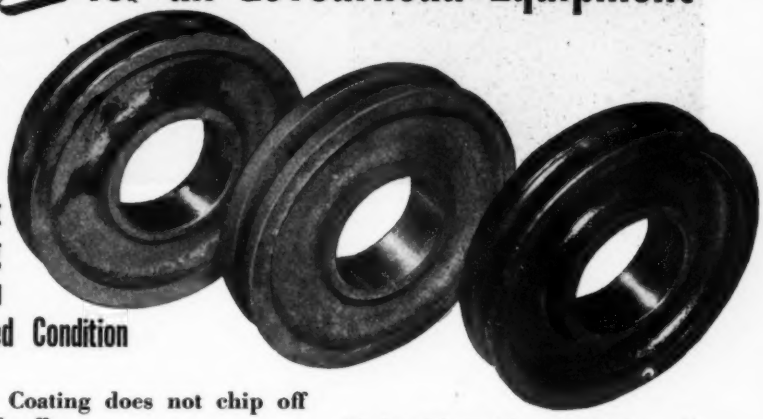

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A special process for treating replacement parts for LeTourneau equipment has been installed to prevent rusting and corroding during months of exposure to salt air and arctic and tropical conditions encountered in shipments and storage of war supplies. This same protection is now given parts for all LeTourneau equipment, both domestic and export shipments . . . at no extra cost to you.

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You save time and money when you get machined parts in good condition, free from rust, corrosion and grease . . . they are easier fitting, take less time and labor to fit . . . last longer because they're not damaged by corrosion . . . assure better equipment operation. The protective coating readily dissolves in oil and grease and has no harmful effect on the lubricating oil or grease used in LeTourneau equipment. If you prefer, the coating may be easily removed with fuel oil, gasoline, kerosene or lubricating oil before using the part.

Take advantage of this extra service . . . get rust-resistant parts for your LeTourneau equipment. Your LeTourneau-"Caterpillar" dealer's Victory Service Base is nearby . . . see him, now, for expert parts and repair service.

Machined sheave (above, left) is thoroughly washed . . . comes out free of grease and dirt (above, center) . . . is then dipped in special solution and dried giving a uniform, plastic-like coating (above, right) which prevents rusting and corrosion. Coated parts are placed in carton for protection against physical damage. On export shipments machined surfaces are further protected with water-tight, air-tight paper wrapping sealed with coat of wax.

Bearings of this type are adequately treated by the manufacturer to resist corrosion under normal domestic conditions. These photos illustrate how extra protection is given parts for export shipment by LeTourneau. Bearing is greased, wrapped in special greaseproof paper, wrapped again with heavy self-sealing wax paper and dipped in wax, thus making a water-tight, air-tight covering. Sealed bearing is then placed in carton ready for boxing.

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Manufacturers of DOZERS, CARRYALL* SCRAPERS, POWER CONTROL UNITS, ROOTERS*, SHEEP'S FOOT ROLLERS, TOURNAPULLS*, TOURNAROPE*, TOURNATRAILERS*, TOURNAWELD*, TRACTOR CRANES

For your convenience in writing to R. G. LeTourneau, Inc., you will find a card bound in this issue.

• The world's largest belt conveyor used to carry aggregate from the Redding gravel pits to Shasta Dam at Coram, a distance of 9.6 miles. Capacity load of this Goodyear belt system is 1,100 tons an hour.

materials estimated at about $65,000,000. Companies making up the Pacific Contractors, Inc., are: Griffith Company, Metropolitan Construction Company, American Concrete & Steel Pipe Company, D. W. Thurston; L. E. Dixon Company, all of Los Angeles; and Lawler & Maguire, Butte; Arundel Corporation, Baltimore; Foley Brothers, New York City; Shofner, Gordon & Hinman, Denver; W. E. Callahan Company, and Gunther, Shirley Company of Dallas; A. Guthrie and Company, St. Paul, and Hunkin Conkey Company of Cleveland.

Four Primary Benefits

Four primary benefits sought through the construction of the Shasta Dam are: control of Sacramento river floods, electric power development, prevention of salt water encroachment, and the stabilization of navigation on the Sacramento river.

In the fall of 1937, this great barrier which will store up the waters of the Sacramento and Pit rivers, was officially named Shasta Dam. In earlier plans it had been known at Kenneth Dam.

When completed, the Shasta Dam will have cost an estimated $170,000,000. It will raise 450 feet above the river bed and will back up water more than 25 miles, creating a water storage reservoir with 3,000,000 acre-feet capacity. The dam will have a crest length of 2,500 feet. Before construction work was started, 3,000,000 cubic yards of earth and rock were excavated at the dam site.

This huge reservoir resulting from the Shasta Dam construction required the relocation of a section of the Southern Pacific Railway and of U. S. Highway 99, a project that was completed this year at an approximate cost of $7,245,000.

The railroad previously ran the entire length of the reservoir directly through the area to be excavated for the dam. To minimize the interference with excavation at the dam site, an 1,800 foot railroad tunnel was cut under the west abutment of the dam, intended for river diversion during the pouring of concrete for the central portion of the dam after the 30-mile railroad relocation was completed around the Shasta reservoir.

The relocation of the railroad and the highway entailed the construction of two railroad bridges and two highway underpasses at a cost of $624,144.50. Work was started in 1939.

One of the bridges, over the Pit river, is a double-decked structure carrying a railroad on the lower deck and a four-lane highway on the top deck. It is 3,587 feet long and 500 feet above the river bed, the highest bridge of its type. Two of its piers are the highest concrete piers in the world, exceeding 350 feet. The other span, the Sacramento river bridge at Antler, is of complicated design with both vertical and horizontal curves and has hollow piers through which water may circulate for increased stability to the structure. Exceptionally heavy grading through rough, mountainous terrain was needed for the Sacramento bridge. Excavation quantities on the southerly four miles averaged 344,000 cubic yards a mile.

Development of Grade Separations

A variety of methods were used in the development of five grade separations between the highway and the railroad. The highway, throughout the greater part of its relocation, was placed at a higher and more economical level than the railroad because of the greater flexibility of its alignment and grade. The highway approaches the Pit river bridge from the left at its southerly end and departs to the right at the northerly end. The railroad approaches from the left and a tunnel beneath the highway departs to the left from its own deck, 60 feet below the highway level. The other three grade separations in the southerly four miles of the work were solved by the simple expedient of locating the highway over tunnels through which the railroad passes deep in the bowels of the mountains.

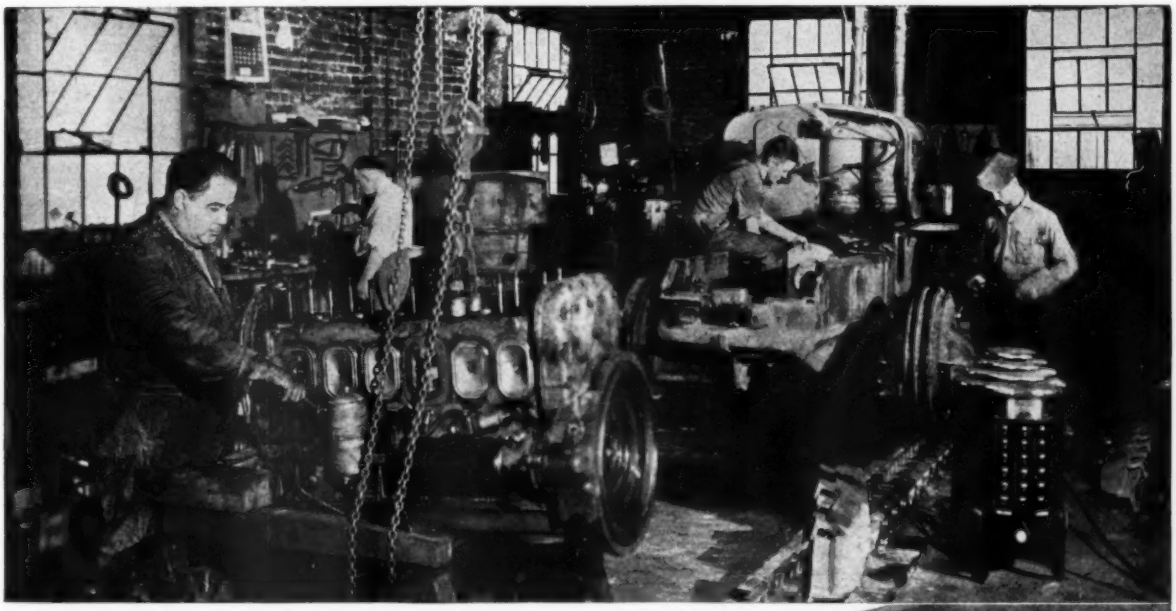
The fifth separation is located near the northerly end of work, on Antler Flat, where a four-lane underpass typical of such construction is located. Consistent with good engineering practice, thought of added problems and costs, and realization of the probability of multiple lane requirements at some future date, the four major bridge structures were designed and built with much foresight. Logically and economically the bridges were constructed to meet standards of the exigencies of a coming day.

Paying close attention to the selection of the placing of subgraded material during the grading phase of the entire 15.3 miles of the road, contractors got excellent results from the native shales through which the many cuts were made. High bearing values were consistent throughout the work. On this sub-grade a pavement was placed consisting of 0.5 foot crusher run base, the full width of the road bed, with 0.2 foot plant-mixed surfacing over the entire 22 feet, topped with a plant-mixed non-skid surfacing applied at the rate of 55 pounds per square yard.

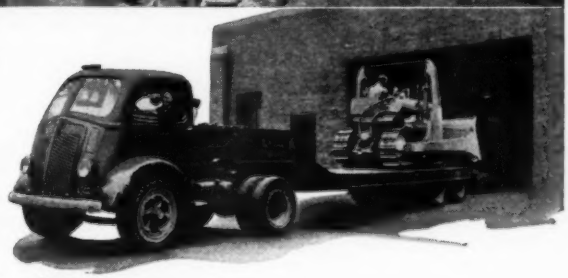
Because of military restrictions there was no public ceremony held in connection with the opening to the public of this relocated portion of the highway last January.

As a result of the improvements in the Sacramento river valley the old Oregon Trail will play a more important part in the history of a future generation of Americans.

A New, Faster, Better Service Plan



EQUIPMENT OWNERS FIND IT PAYS TO HAUL 'EM IN FOR REPAIRS...



Here is a new service plan — of far more benefit to equipment owners. Instead of having dealer mechanics travel to the job to make repairs. . . . it's proved to be much better, faster, more economical to haul your outfits to the dealer's shop. Working in comfort, with warm fingers, proper illumination and the right tools, dealer mechanics find they are able to do more justice to a job, and do it quicker. They have the supervision and expert help of the shop foreman — every problem is quickly solved. Parts go farther — worn out or broken sections are fixed up where possible . . . easily, quickly replaced where necessary. Special tools are available to speed the job — clean surroundings assure proper handling of delicate Diesel parts. In addition, the owner's operators who bring in the machines, work with the mechanics . . . thereby help cut the cost of the work and learn plenty about the care and maintenance of the outfits.

The cost of transporting the machines is surprisingly small . . . and usually they are back on the job sooner . . . ready to work longer. Find out for yourself how well you will like this shop plan. Next time your units need repairing . . . haul 'em into your Allis-Chalmers dealer. He's equipped to do your work right, fast and at bigger savings!

HOW THE SHOP PLAN IS WORKING OUT IN ONE TERRITORY!

"It is surprising how much better the customer has been satisfied and how little it costs to transport the tractor to and from our shop. We are turning out more tractors . . . do a better job . . . get better acquainted with the owners and operators," says Walling Tractor & Equipment Co., Allis-Chalmers dealer at Portland, Ore.

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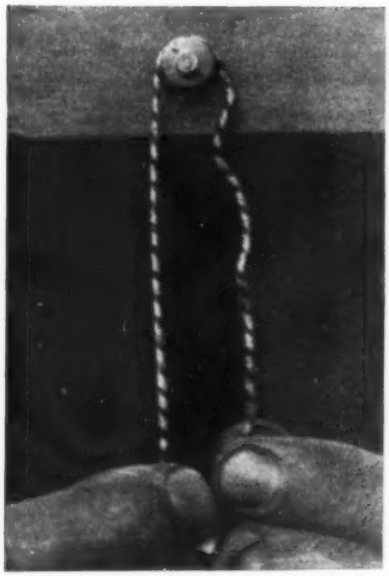
Field NOTES



• An easy method to end aggravating rattles about a machine cab or other moving lightly constructed portions of a machine.

Taking Kinks Out of Wire

Smaller sizes of insulated bell and other wire used for many circuits about the machine and shop are often badly kinked in handling. The usual methods of removing kinks from light wire cannot be used because of possible damage to the insulation which is none too heavy.

Take one end of the small metal wheel cores of a common toy automobile or truck. They have smooth neat grooves into which the small rubber ring or tire snugly fits. Remove this small rubber ring and tack up the wheel with a small nail in some handy spot about the machine. Simply roll the small wire around this as shown in the picture. The kinks will be removed with one turn through the pulley groove and with absolutely no damage to the insulation, no matter how thin or light this insulation may be.—*Frank W. Bentley, Jr.*

Casting Lugs on the Ends of Wire Rope

Split molds of steel are used to cast lugs on the ends of wire rope. These molds are provided for all the sizes of rope used. The two sections of each mold are held together by means of two screws passing through one section of the mold and into the other section. The mold shown in the sketch on this page will accommodate three sizes of rope, each size being stamped on the mold by means of punches.

To prepare the end of the rope, the strands are unlayed for about an inch and the hemp center is cut back about the same distance. The unlayed strands are then cleaned of lubricants and grime by dipping them into a half-and-half solution of commercial muriatic acid and water. The rope should not be inserted so deeply that the acid will get on the hemp center. The strands are then tinned by dipping them into molten solder. It may be necessary to dip the unlayed strands into acid and solder several times before a good tinning job is obtained. By bunching the strands together they are passed through the bottom of the mold, and then are spread apart, after which hard solder is poured into the mold. After the solder cools, the screws holding the mold together are removed, allowing the two mold sections to be separated so the rope with the attached lug of solder can be taken out.

Where solder lugs are to be applied to ordinary, or non-preformed rope, it is necessary to apply a seizing of soft wire to the rope at a point just below the bottom of the mold to prevent the strands from raveling. The seizing must be applied before the strands are opened up, and it should be followed by another seizing an inch or so below the first. After the lug is cast, the seizings may be removed.—*C. R. Hochmuth.*

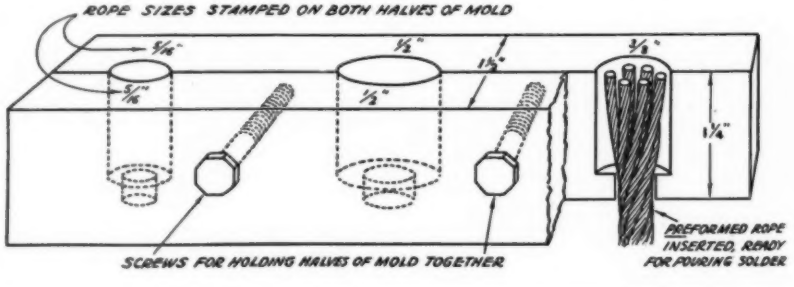
• This handy lantern globe cleaning gadget will make easy an otherwise tedious and difficult task.

Old Rubber Heel Handy

The globe or glass of the common red warning lanterns, due to their irregular shape, are hard to wipe and clean out with the usual cloth poked around on the end of an odd stick.

Take a medium sized old rubber heel, one that will enter the smallest end of the globe and tack it firmly to the end of a stick wide enough to handle easily. The cloth or rag when caught and twisted around the heel affords a templet almost exactly the shape and outline of the inside of the globe. The straight end of the globe is nicely taken care of by the back end of the heel sides. The thickness of the rubber heel gives the wiping cloth a firm but soft wiping contact with the glass.

• Split molds of steel, held together by screws, are used in casting lugs on the ends of wire rope.



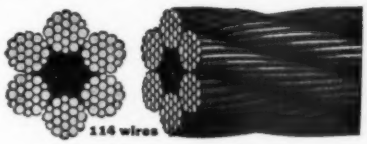
A Short Breaking-in Period Extends Wire Rope Life

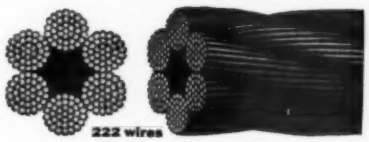
{This is Number 14 of a series of informative articles on how to get the most out of wire rope. It is directed to those who want to do everything they can to lengthen wire rope life and conserve steel. Other articles in the series are available on request.}

* * *

Cooperation in the present emergency is a vital necessity to success. It is a basic fundamental without which wars cannot be won, freedom cannot be maintained.

Cooperation within a piece of wire rope is just as essential to its success, but, being wire rope, it needs our help to do its job.





There are 114 or more wires in the average wire rope. They need to cooperate together by each carrying their share of the load. Illustrated above are two standard ropes showing number of wires in each.

The process of manufacture lays these wires into a rope and manufacturers ship this rope to you prepared to do its task.

The rope's success depends a great deal on how it becomes adapted to the equipment and to the work it must do.

WHAT "BREAKING IN" MEANS

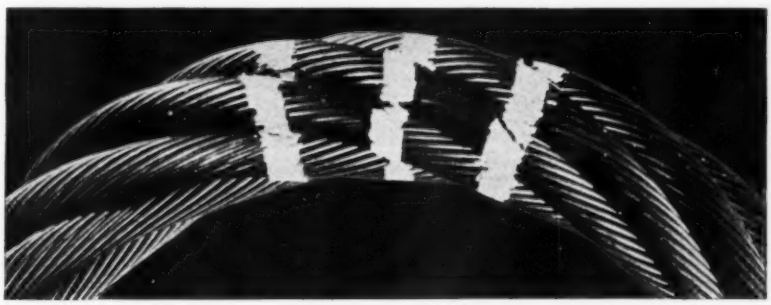
For example, we all know that the life of a book depends upon proper handling at the start. To simply grab a book and pop it open injures the binding, but by gradually and carefully opening the book at different points, it becomes "broken in" and its life is greatly extended.

Wire rope is a complex machine that has many wires, like a book has many pages. When the rope is put into use, a little care in handling and operating it at first, pays dividends later. Haste makes waste, which you want to avoid.

The breaking-in period gives the rope a chance to adapt itself to the track or path in which it must travel. It becomes accustomed to the arc of bending, becomes comfortably seated in the groove and assures the operator, after a short "trial run," that it is ready to go to work safely.

"BUT WE CAN'T TAKE THE TIME TODAY!"

The actual time taken to properly break in a rope is a small percentage of the time it takes to install a rope. If you must replace rope often and you can cut down the number of replacements by extending rope life, you will be conserving steel, reducing costs, and actually saving time.



BENDING DOES THIS

To get the picture (above) three white stripes were painted around a ⅝" 6x37 PREformed wire rope before bending. Then the wire rope was flexed by hand and this picture taken. Notice how the paint cracked up and separated, caused by the movement of the wires and strands to make the bend. Getting the rope accustomed to this flexing and wire and strand movement is a job of breaking in.

"WHAT SHALL WE DO?"

First, as has been explained in previous articles of this series, the equipment should be in good repair.

Second, as explained in article 9 of this series, the rope should be unwound from the reel or coil so as to avoid twisting and kinking.

Third, the rope should be firmly attached to the equipment, taking care to seize it with wire to prevent it untwisting.

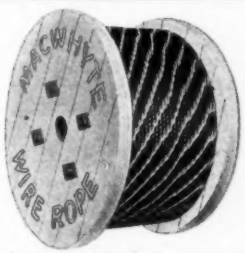
Fourth, after rope is attached and reeved around sheaves and drums, operate it without load a few times, until you see that it is flexing easily over sheaves and winding correctly on the drum.

Fifth, gradually increase the speed and load until the rope is operating up to its normal loading and speed.

WHAT ABOUT PRE-FORMED ROPE?

During the manufacture of the rope, the process of PREforming adjusts the wires and strands into the helical shape they take in the rope. This is often called a "breaking-in" process that helps prepare the rope for quick use and therefore it should not require as much "breaking in" on the job.

However, whether PREformed or non-preformed, it pays to handle the rope carefully and give it a chance to get accustomed to the operation of the equipment.



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. . . Macwhyte premier wire rope, famous for its strength, toughness, and internal lubrication.

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MACWHYTE Special Traction Elevator Cable MACWHYTE Braided Wire Rope Slings MACWHYTE Aircraft Cables and Tie-Rods

For your convenience in writing to Macwhyte Company, you will find a card bound in this issue.

Shots from the FIRING LINE

Release 1,532 Vehicles Under Truck Rationing

A total of 1,532 vehicles was released under the truck rationing program during the week ended March 6, the WPB Automotive Division announced.

Civilian users and holders of Government Exemption Permits received 186 light, 1,672 medium, and 350 heavy trucks, 202 trailers and 122 miscellaneous vehicles. The miscellaneous vehicle category includes station wagons, ambulances, hearses, etc.

Since the rationing program became effective March 9, 1942, a total of 111,758 vehicles of all types has been released. The total includes 23,804 light, 60,162 medium, and 14,053 heavy trucks, 8,419 trailers and 5,320 miscellaneous vehicles.

Fluorspar Industry Again Establishes New Record

Despite labor and other difficulties, production and shipments of fluorspar in 1942 were eight and 12 per cent greater than in 1941, the previous record year, according to final 1942 figures made public by the Bureau of Mines, United States Department of the Interior.

Production of fluorspar totaled 337,000 short tons in 1942 compared with 313,000 tons in 1941. The Illinois-Kentucky district accounted for 79 per cent of the total in 1942 as compared with 86 per cent in 1941.

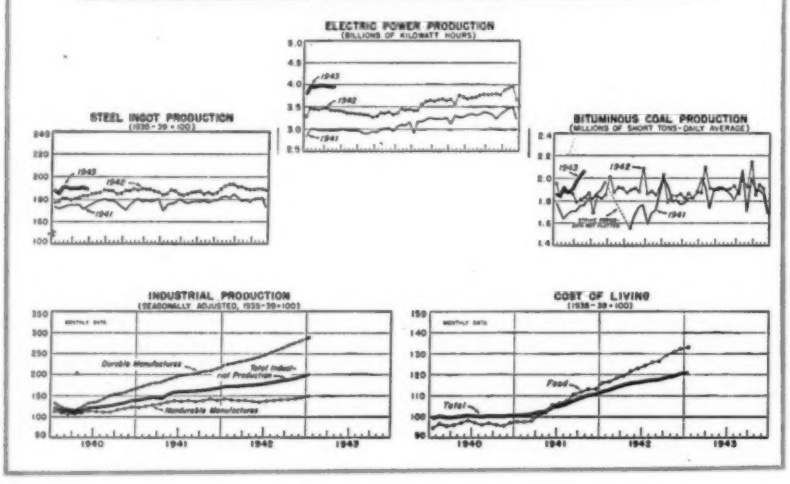
Shipments from mines in 1942, amounting to 360,316 short tons, were 12 per cent greater than in 1941 (the previous record year) and 37 per cent more than the 263,817 tons shipped in 1918 of World War I. Shipments from Illinois, New Mexico, and Utah established new highs; those for Illinois (161,949 tons) exceeded by 3.4 per cent the previous high (156,676 tons) attained in 1917. The movement from Kentucky in 1942 was six per cent under the all-time record made in 1941. Shipments by river or river-rail (79,049 tons) also made a new record. Of the 1942 shipments, 63 per cent moved to steel plants (67 per cent in 1941), 24 per cent to hydrofluoric acid plants (16 per cent in 1941), six per cent to glass and enamel plants (10 per cent in 1941), and seven per cent to other industries, including exports (seven per cent also in 1941).

Steel mills, the bureau reported, are the principal consumers of fluorspar, but much larger quantities were used in 1942 in the production of hydrofluoric acid, which is essential in the manufacture of artificial cryolite and aluminum fluoride, aluminum raw materials. The glass industry ranks third in importance as a consumer of fluorspar but it used less than in 1941. The enamel industry, which formerly ranked fourth, dropped to sixth place in 1942.

Publication of foreign trade statistics was suspended beginning October 1, 1941, and as a result, import and export data for 1942 cannot be released.

• In addition to excavating and backfilling operations the City of Springfield, Massachusetts, uses this Bucyrus-Erie TD-14 Bulldozer to tote pipe during sewer construction operations.

BUSINESS INDICATORS



ARBA Finds Post-war Economy Demands Program

A shelf of highway projects, complete with plans, specifications and cost estimates, ready for contract at the end of the war should be the contribution of the highway industry and profession to winning the peace, according to research showing the urgent need for this

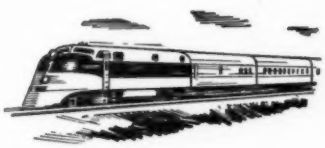
WAR JOBS WELL DONE
MEAN LOWER FUTURE POWER COST

SCARCELY anything you can name fills so many different war jobs as the General Motors Diesel engine. In tanks, landing boats, patrol boats, trucks, tractors and auxiliaries—everywhere sturdy dependability is needed—they're supplying power for our fighting forces.

The result is that though plant facilities have mushroomed and production records are broken time and time again, everything we can make is hustled off to war.

But there is this important compensation. These accelerated war demands are advancing GM Diesel production and technique years faster than could the demands of ordinary peacetime manufacture.

So we can look forward to lower-cost power and to new peacetime applications for these engines when the war is won—to broadened fields where this power will serve.



New eras of railroading follow in the footsteps of war. Another new era of railroading is assured in the wake of this war. General Motors Diesel locomotives already are establishing new standards of transportation.

GM
GENERAL MOTORS
DIESEL POWER

ENGINES . . . . . *15 to 250 H.P. DETROIT DIESEL ENGINE DIVISION, Detroit, Mich.*

ENGINES . *300 to 2000 H.P. CLEVELAND DIESEL ENGINE DIVISION, Cleveland, Ohio*

LOCOMOTIVES . . . . . *ELECTRO-MOTIVE DIVISION, La Grange, Ill.*

For your convenience in writing to Detroit Diesel Engine Division, you will find a card bound in this issue.

• A shovel stripping overburden from a 480-acre deposit of fire clay at the Illinois Clay Products Company's Goose Lake property near Morris, Illinois, receives a helping hand from a Caterpillar-mounted LeTourneau 'dozer.

planning being carried on by the American Road Builders' Association. Preliminary findings, developed by ARBA Engineer-Director Charles M. Upham and Research Engineer Daniel R. Lamson, will be given further study by the association's committee on the post-war highway program.

Full employment and a high national income are the major objectives for the post-war period. An analysis of two decades of changing economic conditions, the prosperous twenties and the partial recovery of the thirties, shows that these two conditions were existent only when construction activity was at the proper level. The ARBA study establishes five essentials for the years after the war. They are: (1) there must be no unemployment; (2) construction volume must be maintained at a high level; (3) there must be a long-range highway construction program; (4) there must be no improvised relief work; and (5) there must be a shelf of highway projects of sufficient size to insure an annual $3,000,000,000 program for at least five years. This $3,000,000,000 program would include federal, state, county and municipal construction and represents a figure somewhat higher than the 1929 construction program.

It is estimated that between 30,000,000 and 40,000,000 men will be released from the decelerating war industries and the U. S. Army at the close of the war. It is not only necessary that employment be provided for these men, but they must be employed on useful work that will contribute to the national wealth and improve the standard of living. Experience in the last depression also demonstrated that the most efficient means of production must be utilized, in order that the product should be commensurate with the outlay.

The study also shows that in recent periods of our greatest prosperity, construction investment varied from 12 to 15 per cent of our national income. Full employment is reached when the national income is from $100,000,000,000 to $105,000,000,000. The conclusion is that prosperity would require a total investment in construction, including private, corporate and federal, of at least $12,500,000,000.

Highway construction, according to the ARBA report, is particularly suited to meet post-war requirements. It contributes to the national welfare and fits well into the construction investment area. It has been developed by private enterprise and does not compete with private enterprise. The construction of highways attracts additional investments, generally of a private nature. Since our highway transportation is inadequate to take care of normal traffic demands, highway construction can be located in practically any part of the country and highway projects may be quickly started or dropped, according to employment requirements. Evidence also shows that the most efficient way to carry on this type of work is by the contract system and competitive bidding.

The private post-war construction program has been estimated at $10,000,000,000 a year for a period of years. Supplementing this, public expenditures of $5,000,000,000 could be spent on useful projects, to include $3,000,000,000 on highways and $2,000,000,000 on other public works. In this last category, airports and flight strips should take up a substantial amount of the total.

Brazilian Iron Ore May Help Allies

By R. P. Day

Underground, below the tropical heat of Brazil's Itabira region, lies the largest known deposit of high grade iron ore in the world. For years it has lain unexploited—the unfinished dream of Brazilian industrialists who hoped some day to supply part of their own steel and export vast quantities of rich ore as well. With the help of a recent $14,000,000 U. S. Lend-Lease grant for preliminary work, this dream may soon be a reality.

Conservative geological estimates say the Itabira region contains between 12 and 15 billion tons of ore, compared to 900 million tons in Minnesota's Mesabi Range and the one and a half billion tons in Sweden's Kiruna deposit. Practical difficulties of extracting this ore in quantity are enormous.

The main problem is to get the necessary excavating, mining and processing machinery from the United States. An absence of good coking coal will probably prevent Brazil from exporting large quantities of steel for some years to come. There is nothing to prevent her exporting iron ore, however, for she produced 500,000 tons for the Allies in 1942, and can triple that production if machinery, ships and the solution to a gigantic excavation problem are provided.

Brazil has taken the initial step in a direction best calculated to liquidate private capital in the Itabira region. With $400,000 of the 14 Lend-Lease millions she purchased a privately owned British railroad leading to the mines. Work has already begun on railroad yards and a loading station, but thus far it is a medieval, discouraging business of plodding burros, hand labor and carts. The arrival of American built power shovels, hauling units, bull-

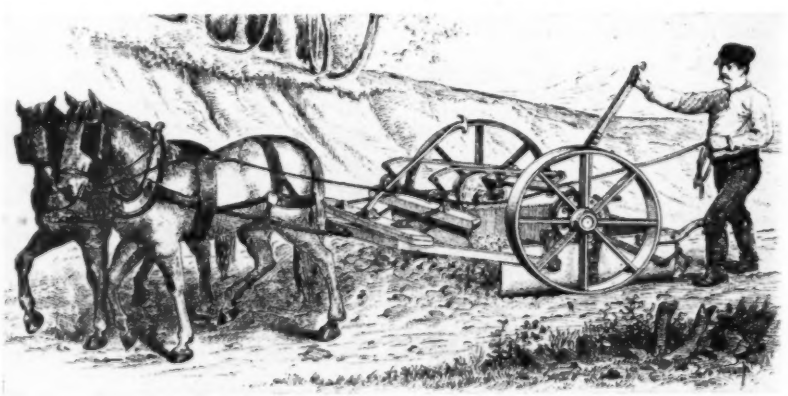
In Memoriam

Dr. C. H. Krause

It is with regret that we announce the passing of Dr. C. H. Krause, vice-president and treasurer of the Columbia Quarry Company, operators of limestone quarries at St. Louis, Missouri.

Dr. Krause died on February 8, 1943, at the age of 69. He had been connected with the Columbia Quarry Company since its organization in 1906 and was active in the interest of the company.

• Patented in 1884, this horse drawn two-wheeled scraper was the forerunner of the present rubber - tired, fast - moving tractor powered machines.



WHEN the Chief Test Driver here at Ward LaFrance turns one of our whopping big ten-ton Tank-Recovery Wrecker units over to the Army, he *knows* it's good. One of the biggest things on wheels in any army, this wrecker has to go places trucks never went before — because it's built to recover disabled tanks.

Before the Army inspector tests these babies, Ward LaFrance puts them through gruelling paces that would exceed the endurance of less sturdy brutes. This before-delivery test under full load is unique with Ward LaFrance . . . typical of the way we do things here.

When the war ends and you want a tough truck built for a special job, just check the performance of these Ward LaFrance heavy wreckers. Records are being made right now under the worst possible conditions, all over the world.

WARD LAFRANCE TRUCK DIVISION

★ GREAT AMERICAN INDUSTRIES INC. ★

Ward LaFrance

ELMIRA, NEW YORK

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dozers, conveyors and crushers will change that picture.

If the needed machinery arrives in time, and if shipping retains its status, it is not at all unlikely that Brazil may take her place as an exporter of iron ore in the war against the Axis.

Complete General Plans for Brooklyn-Staten Island Tunnel

By Bethune Jones

It was announced March 8 that the New York City Tunnel Authority had completed test boring and general plans for a Brooklyn-Staten Island vehicular tunnel and would shortly ask the New York State Legislature for funds to prepare detailed plans and specifications so that the project may be started as soon as possible after the war.

Coincidently it was revealed that Joseph A. Palma, borough president of Richmond, and John Cashmore, Brooklyn borough president, were ready to ask the New York City Board of Estimate for a $75,000 appropriation for plans for the tunnel approaches in Brooklyn and Staten Island.

Now shaping up as a definite post-war undertaking, the proposed Brooklyn-Staten Island tunnel had often been discussed previously but never advanced very far.

During its 1942 session, the New York Legislature appropriated $50,000 to the New York City Tunnel Authority for the test borings and general plans that have now been completed. The funds for detailed plans, which the Authority was expected to seek from the current legislature, would come from the state's appropriation for post-war projects.

The tunnel approaches already have been included in the city's post-war construction program, with $75,000 earmarked for preparation of plans for this work. The actual expenditure and the letting of contracts, however, at this writing still awaited authorization by the city board of estimate.

Cost of the entire tunnel project, including approaches and land, would be $70,000,000, it has been indicated by preliminary estimates. Engineers estimate it would require four years to build.

Under present plans, the tunnel would be two miles long, running from Bay Ridge, Brooklyn, to Rosebank, near Fort Wadsworth, S. I., which is more than a mile from the Staten Island ferry landing at St. George. Plans call for a two-tube, four-lane tunnel similar in construction to the Queens-Midtown Tunnel between Manhattan and Queens.

In Brooklyn the entrance to the Brooklyn-Staten Island Tunnel and the Brooklyn-Battery Tunnel would be only four or five miles apart, and at the New York City Tunnel Authority it was stated that completion of the two tunnels would make it possible to go from Manhattan to Staten Island faster by car than is now possible by ferry. It was estimated that a driver, using the two tunnels, could go from the tip of Manhattan to Staten Island in 16 minutes compared to 20 minutes by ferry. And the 20 minutes does not include time consumed waiting for a boat.

Virtually all work on the Brooklyn-Battery Tunnel has ceased because of the war and the project's completion date, originally 1944, is now indefinite.

A. G. C. Board Meeting

The construction industry has the job during 1943 of adapting to constantly changing war conditions so that it can continue to make its maximum contribution to winning the war, President Oscar B. Coblentz said in reviewing the meeting of the governing and advisory boards of The Associated General Contractors of America held in Chicago, February 15 and 16.

The meeting was held in place of the 24th annual convention. Members of the association had voted to hold the small board meeting instead of the convention as an aid to the war effort.

"During the first phase of the war effort the emphasis was on construction, and for two and a half years the industry has been breaking all previous speed records in executing its greatest volume of work in history which has been the foundation of the entire war effort. Delay in construction would have caused delay in the training, equipping

SPEED OUTPUT with GATKE SWING FRICTIONS

GATKE moulded Swing Friction for a NORTHWEST Shovel. Available for all models.

GATKE QUALITY BRAKE LINING & CLUTCH FACINGS are made for ALL applications

Non-Metallic Bearings to Replace Bearings of Critical Metals

TREMENDOUS POWER—for effortless control—no let down when things get hot.

SMOOTH ACTION—for precision inching—no grabbing or chattering.

LONG WEAR LIFE—beyond comparison.

. . . These are some of the reasons why GATKE Swing Frictions help get the job done FASTER. Try them and compare results!

Moulded to finished dimensions in all shapes and sizes—LARGE or small.

Shipped from stock for popular shovels, cranes, hoists, etc. Just tell us what you need or send for literature.

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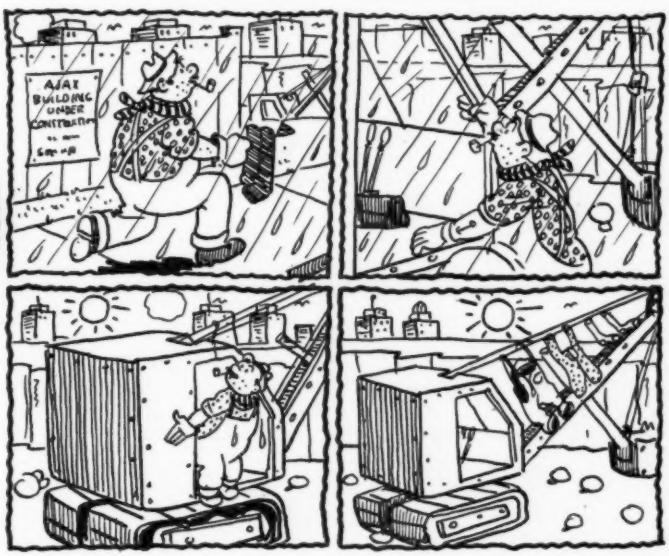
"Sure she's just a mirage — but she's marvelous!"

"Snodgrass' wife wears the pants in the family — on her night shift at the munitions factory!"

"You know, sometimes I think Hagerty oversteps his authority on that flagman's job."

"Second from the right is kinda cute."

"I'm afraid you'll have to give up your paper route on this job, Mr. Henningway."



and launching of attacks by our fighting forces," Coblentz said.

"The peak of war construction has now passed, although as much war construction must be performed in 1943 as the total volume of many previous years. So much work must be done yet in winning the war that the industry must continue to devote its full efforts to direct war work or to essential civilian activities. It has three big jobs ahead. They are:

"To complete the remaining volume of war construction with all possible speed and efficiency.

"To maintain the physical plant of the nation which the industry has built, to keep war and essential civilian activities from breaking down, and to repair damage. Most economical use can be made of manpower if this work is performed by the industry.

"To turn the excess capacity of the industry to other types of war production where the capacity of men and management in the industry for performing huge volumes of work can be used most effectively."

After the war, construction will be the largest industry able to return immediately to peace-time pursuits. It will have the responsibility of providing a great amount of employment during the adjustment period to follow the end of hostilities. It must be prepared for this job, and the rebuilding of America to follow, according to President Coblentz.

Managing Director H. E. Foreman, in presenting his report on the association during the past year, concluded:

"The association is fulfilling the primary purpose for which it was founded by providing the means through which the government and the industry can cooperate for war construction.

"The industry has attained its greatest accomplishments at a most critical time in history. Critical days and months are ahead. The future will be well taken care of if the association and the industry continue each day to direct their energies to primary objectives and act with the experience and confidence gained from past performances."

The meetings featured full discussion of the many problems facing general contractors at the present time and in the future. These subjects included labor matters, public relations, accident prevention, war time restrictions, contract renegotiation, taxation, price regulation for construction, and future planning.

The time and place of the next meeting of the Governing and Advisory Boards was left with the Executive Committee.

Mr. Coblentz, president, McLean Contracting Co., Baltimore, Maryland, was installed president to succeed Dan W. Kimball, president, Owen-Ames-Kimball Co., Grand Rapids, Michigan. William Muirhead, president, William Muirhead Construction Co., Durham, North Carolina, succeeded Coblentz as vice president. E. Marshall Rust, of Washington, D. C., vice president of the Rust Engineering Co., was re-elected secretary-treasurer.

New chairmen and vice chairmen of the divisions were elected as follows:

Building Contractor's Division: Paul M. Fogel, Fogel Construction Co., Kansas City Mo.; and Ford J. Twaits, Ford J. Twaits Co., Los Angeles, California.

Highway Contractors' Division: W. P. Roscoe, W. P. Roscoe Co., Billings, Mont.; and Dwight W. Winkelman, D. W. Winkelman Co., Syracuse, N. Y.

Heavy Construction and Railroad Contractors' Division: A. Teichert, Jr., A. Teichert & Sons, Inc., Sacramento, Calif.; and C. E. Lott, John F. Casey Co., Pittsburgh, Penn.

New members of the Executive Com-

For Fast Operation in Those "Tight Spots"

Simplex No. 304. 10-ton jack. Raises on both up and down stroke. 22¾" high; 13½" lift; side toe 2¾" from ground level. Weight, 62 lbs. No. 304T is trip type. (Capacity 15 tons)

Toe lift at right angles to lever bar permits working close to walls, in narrow aisles, on bridges, cribbing, etc. There's a Simplex for every construction jacking problem that arises.

Templeton, Kenly & Company Chicago

Better, Safer Construction Jacks Since 1899

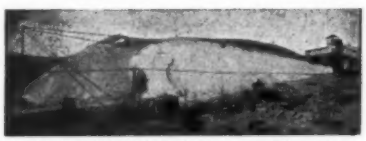
Simplex LEVER · SCREW · HYDRAULIC Jacks

Make Your Jacks Last Longer!

Send for bulletin on the proper care of jacks.

DIGGING AND STOCKPILING SIMPLIFIED

With a Sauerman Power Drag Scraper



A simple SAUERMAN Scraper machine stores and reclaims a seasonal surplus of 30,000 tons of screenings at crushing plant.

Here's another small SAUERMAN Scraper that moves sand from hill to asphalt plant at cost of 4 cents per cubic yard.

This shows a typical SAUERMAN Scraper layout for storing and reclaiming large tonnage of coal, or any bulk material.

MANY excavating and stockpiling jobs involving hauls of 100 to 1500 ft. are reduced to their simplest terms by using a SAUERMAN Power Drag Scraper which loads, conveys and places the materials in one operation.

First cost of a SAUERMAN Scraper machine is reasonable, maintenance expense is small and labor is reduced to a minimum.

Moreover this equipment is very flexible and is readily adapted to meet any new and difficult working conditions. Sizes range from small portable units designed for cheap handling of a small hourly tonnage of loose materials up to powerful machines with capacities of 1,000 tons per hour.

Write for Catalog

SAUERMAN BROS., INC.
574 S. Clinton St., Chicago

For your convenience in writing to the advertisers on this page, you will find a card bound in this issue.

Handle with Care

—it's got to last!

THIS year your wire rope must be made to last as long as possible. It must do more work. Must work longer hours. It must deliver more service than ever before. Only with proper care can this be accomplished.

American Tiger Brand Wire Rope has long life and service built into it. No other rope will last longer under tough usage. Or is easier and safer to use. But even a quality rope like U·S·S American Tiger Brand requires care and attention to give the maximum service and top efficiency required right now.

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Every user of wire rope can get a lot of good ideas from this informative book. It's packed with easy-to-follow instructions. Pocket-size, handy and thoroughly practical, "Valuable Facts" will help you avoid common errors of handling and care that shorten rope life. Order as many copies as you need. Get them into the hands of the right men. Never forget—wire rope is indispensable to the war effort—you've got to make it last.

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UNITED STATES STEEL

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mittee, approved by the governing board were: Coblentz; Muirhead; Roscoe; Fogel; Teichert; F. W. Parrott, Sioux City, Iowa; H. A. Dick, Portland, Ore.; Dan W. Kimball, Grand Rapids, Mich.; M. W. Watson, Topeka, Kans.; H. B. Zachry, San Antonio, Texas; E. P. Palmer, New York City; and A. E. Horst, Philadelphia, Penn.

Directors who were reelected to the Governing Board were: W. S. Bellows, Houston, Texas; F. W. Parrott; C. A. Long, Bessemer, Ala.; C. E. Lott; and A. F. Eggleston, Meriden, Conn.

New directors elected were: C. F. Sanborn, Seattle, Wash.; A. Teichert, Jr.; Clarence Waterfall, Ogden, Utah; C. C. Rutherford, Leavenworth, Kansas; Mark A. Cullen, Janesville, Wis.; C. B. Freeman, Cleveland, Ohio; and F. L. Shackelford, Greenville, S. C.

G. W. Maxon, Dayton, Ohio, presented trophies to winners of the accident prevention contests. Trophies and winners were:

Shackelford Trophy in the building division: H. B. Alexander & Son, Harrisburg, Penn. Honorable mention to Vappi & Company, Cambridge, Mass.; and W. D. Berry, Inc., St. Petersburg, Fla.

Zachry Trophy for highway division: Potomac Construction Co., Martinsburg, W. Va. Honorable mention to DeSalva Construction Co., Cincinnati, Ohio; and Burrell Construction Co., New Kensington, Penn.

In the New England contest, first place was awarded to Vappi & Company. Honorable mention to H. P. Cummings Construction Co., Ware, Mass.; and to Carilli Construction Co., Dorchester, Mass.

The Cashman Trophy for the greatest increase in membership was awarded to the Southern California Chapter, Los Angeles. Chapters receiving honorable mention were Indiana General Contractors' Association, Indianapolis; Central California Chapter, San Francisco; Northern California Chapter, San Francisco; and Miami Chapter, Miami, Fla.

The award for the outstanding accomplishment in demonstrating to the public the adaptability of construction service to the public need went to Henry J. Kaiser and associates, with honorable mention to those engaged in building the Alcan Highway.

Secretaries Council Officers

New officers elected to the A. G. C. Secretaries Council were R. J. Hendershott, manager, Associated General Contractors of Minnesota, chairman; Roy A. MacGregor, executive secretary, Constructors Association of Western Pennsylvania, vice chairman; and Frank H. Conner, acting executive secretary, Carolinas Branch, secretary.

Florida Road Department Adopts Construction Budget

Including a total of $16,500,000 for construction already under way or proposed, a $31,500,000 budget for 1943 was adopted by the Florida State Road Department at its annual budget meeting February 25 in Tampa.

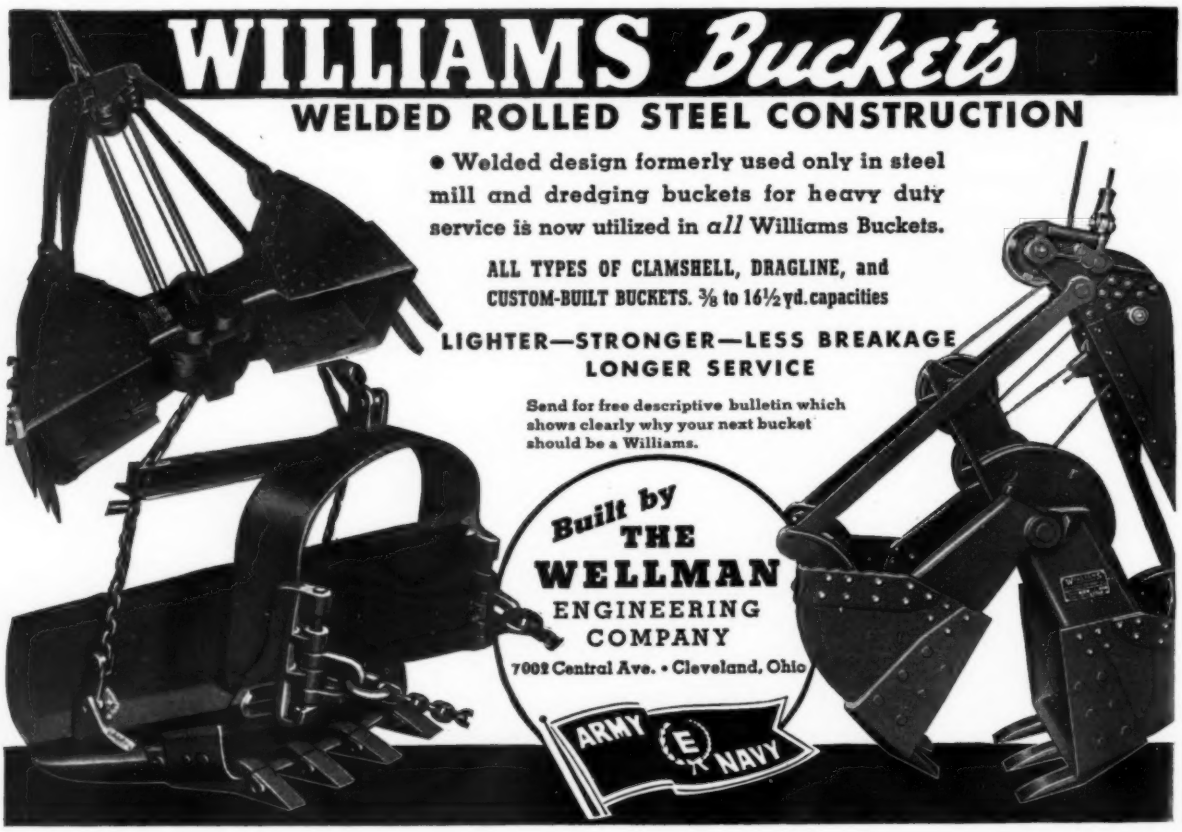
County delegations attending the meeting were reminded by Chairman Thomas A. Johnson that construction will be limited to strategic roads of military significance on which the Federal government will share the cost. Many of these are access roads to training bases and air fields.

Of the total construction, that underway totaled $9,500,000, while $7,000,000 was proposed. Supporting revenue for the construction was listed as including $11,500,000 of federal funds, $4,500,000 of state funds, and $500,000 of county funds.

Setting up $6,394,000 for highway maintenance, the department said this was necessary because of increased use of the highways by heavy military vehicles.

The budget's principal anticipated revenues included $12,429,000 from the federal government, $10,200,000 from gasoline taxes, and nearly $8,000,000 of cash on hand, including reserves and $3,000,000 credited by law to counties in the gasoline tax distribution system.

The budget provides for assumption by the state of the maintenance of six more bridges on connecting-link highways. The bridges, and the estimated maintenance costs this year, are Southeast Second Ave. at Miami, $3,420; Lake Worth Bridge at Lake Worth, $1,895; Flagler memorial at West Palm Beach, $2,985; the Intercoastal Water-


WILLIAMS Buckets
WELDED ROLLED STEEL CONSTRUCTION
• Welded design formerly used only in steel mill and dredging buckets for heavy duty service is now utilized in all Williams Buckets.
ALL TYPES OF CLAMSHELL, DRAGLINE, and CUSTOM-BUILT BUCKETS. 3/8 to 16½ yd. capacities
LIGHTER—STRONGER—LESS BREAKAGE
LONGER SERVICE
Send for free descriptive bulletin which shows clearly why your next bucket should be a Williams.
Built by THE WELLMAN ENGINEERING COMPANY
7002 Central Ave. • Cleveland, Ohio
ARMY E NAVY

For your convenience in writing to The Wellman Engineering Co., you will find a card bound in this issue.

a jungle gets a "Shave"!

Baker Hydraulic Bulldozers Do the "Barbering"

Contractors and road builders who have piloted Bakers through piney woods and forests would get a kick out of the way cat-skinners in uniform are using them to clear patches of jungles that are as tangled as spaghetti, sloshing through mangrove swamps that were yesterday thought impenetrable.

When the peace treaties are signed and the big post-war rebuilding job gets underway, ask the vets who saw the amazing job Bakers did—ask the boys who ran them what they think of *direct hydraulic lift and full down pressure on the blade*—of Baker's fast, positive action and ease of maintenance. Then, you'll want Bakers, too!

THE BAKER MFG. CO.

"If it concerns Victory, it concerns us"

504 Stanford Avenue
Springfield, Illinois

News from "Down Under"

War Correspondent: "This isn't like the Spanish-American War, is it?"

Army Engineer: "Hell, no! Malaria, typhoid and dengue were our worst enemies then, I believe."

W.C.: "This war seems more than a matter of fighters and guns. I notice a lot of construction machinery in use in this neck of the woods."

A.E.: "Yes, this war tops all others when it comes to the use of equipment such as you see along highways and around building projects all over the States in peace-time. Take those bulldozers over there—it'd be tough goin' without those babies—not only here, but on all our fronts."

W.C.: "I suppose it would be a tough job carving landing fields and roads out of that dense tropical growth without those rigs?"

A.E.: "Tough job? It would be practically impossible! You see, those dozers bowl over trees, tear out matted bougainvillaea, grub out roots that would quickly start growing again if you didn't eradicate them, fill up the holes that are left and level smooth as a pool table, ready for surfacing—do it single-handed."

W.C.: "How do the Nips do it?"

A.E.: "Mainly with 'rice burners,' using picks and shovels. These bulldozers are our ace in the hole. When Nip captives see how we do it, they lose their superiority complex, but pronto."

(Based on a news story, "Yank Engineers 'Lift' Faces of South Sea Isles," by E. R. Noderer, Chicago Tribune ace war correspondent.

BAKER

The Modern Tractor Equipment Line for
EARTH MOVING
LEVELING AND GRADE BUILDING
SNOW REMOVAL
ROAD MAINTENANCE

For your convenience in writing to Baker Manufacturing Co., you will find a card bound in this issue.

way span at Riveria, $3,525; the Ormond bridge on Road 468 in Volusia County, $3,400, and the Broadway Bridge at Dayton Beach, $23,600.

Construction Contracts Increase

The valuation of contracts awarded during January for all types of construction amounted to $350,661,000, according to the F. W. Dodge Corporation. This is an 11 per cent increase over January, 1942, but represents a 50 per cent decrease from December.

Non-residential and residential building valuation, combined, exceed January a year ago by 17 per cent. Heavy engineering work fell six per cent behind. Compared with December, the January valuation of combined non-residential and residential building is off 40 per cent while heavy engineering is off 68 per cent.

New dwelling units created in January in new buildings and through conversion of existing buildings totalled 27,127 or 54 per cent more than in the previous month and 16 per cent more than in January a year ago.

Start Engineering Work on Post-war Highways

Engineering work for post-war public construction is now under way in 22 States where highway departments are preparing detailed plans and specifications for roads and bridges estimated to cost $170,000,000, it was reported to Major General Philip B. Fleming, Federal Works Administrator by the Public Roads Administration of FWA.

A joint Federal-State undertaking, this engineering activity is being financed from a special $10,000,000 fund authorized in the Defense Highway Act of 1941. Commissioner Thomas H. MacDonald of the Public Roads Administration pointed out that since the act requires the states to match the federal contributions, plans for a highway building program to cost nearly $500,000,000 are developing rapidly. This would be equivalent to about two years of normal federal-aid highway construction, Commissioner MacDonald said.

"The purpose of this advance engineering is to provide fully-planned, road-building projects ready for immediate construction after the war," he added. "A considerable number of these projects will be located in and around cities to provide employment for men demobilized from the armed forces and the war industries, and to relieve America's No. 1 traffic problem, which is in the cities."

The class and approximate number of advance-engineering projects approved to date by Public Roads Administration are: limited-access highways, urban, seven; limited-access, rural, nine; major city arteries, 40; alternate routes around cities, 80; and major rural highways, 85. Planning projects have been approved in and around the following cities:

ALABAMA—Anniston, Birmingham, Centerville, Dothan, Huntsville, Mobile, Montgomery, Oxford, Troy, Tuscaloosa.

CALIFORNIA—Los Angeles, Oakland, Richmond, San Francisco.

DISTRICT OF COLUMBIA—Washington.

IDAHO—Boise, Coeur d'Alene, Lewiston, Pocatello, Sandpoint.

ILLINOIS—Alton, Centralia, Chicago, East St. Louis, Effingham, Peoria, Rockford, Rock Island, Springfield.

KANSAS — Junction City, Kansas

(*Continued on page 198*)

Since 1916
Haftrak and Traktrailer transportation by

LINN

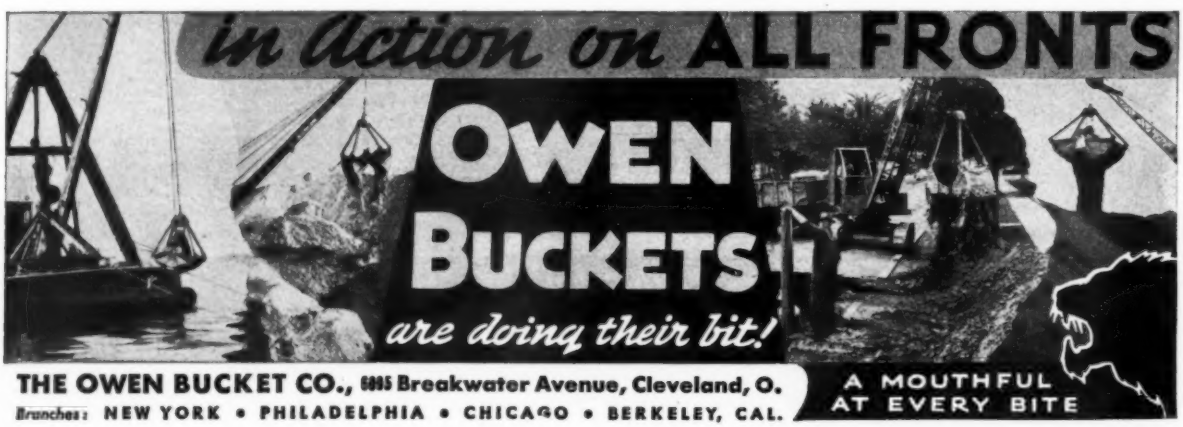
CONTOUR-FOLLOWING TRACTION

LINN is proving invaluable in war work by moving **heavy loads** where no roads exist
The more it carries, the more it can pull.

The Linn Manufacturing Corporation
Morris, New York

in Action on ALL FRONTS

OWEN BUCKETS are doing their bit!



THE OWEN BUCKET CO., 6885 Breakwater Avenue, Cleveland, O.
Branches: NEW YORK • PHILADELPHIA • CHICAGO • BERKELEY, CAL.

A MOUTHFUL AT EVERY BITE

For your convenience in writing to the advertisers on this page, you will find a card bound in this issue.

Construction Crews are Not "Expendable"

These reminders of safe excavator operation may save you serious time-losses and help to keep your men working 100 per cent on the job for victory:

Replace ropes as soon as they show broken strands. A few shifts of extra rope service is not worth a serious accident.

Set dipper or bucket solidly on the ground when leaving the machine—never suspended in the air. By doing this there's no danger that a cooling brake or a creeping drum will pin a man under the load.

Always disengage engine clutch when engine is stopped and whenever operator leaves his seat. Do not engage engine clutch till after engine is started.

Always watch dipper, bucket, or load while it is moving. If you must look away, stop hoist and swing motions. Accurate control adjustments are essential to safety.

Keep eyes peeled for cave-ins; swing machine clear; if necessary, back it out of danger.

Teach pitmen alertness at all times. A rolling stone can maim or kill as well as a bullet.

During blasting operations, turn rear end of excavator toward the blast, moving machine to as safe a position as possible. In an emergency the dipper, set back on the pit floor, makes the safest shelter from blast fragments.

Safety first, last and all the time is a "must" for everyone on the job. Uncle Sam needs every possible man-hour on the production front; each time-loss is a victory for the Axis.

Bucyrus-Erie employees have accepted the award of the Army-Navy "E" as a challenge to keep production rising. * *

Bucyrus-Erie

SOUTH MILWAUKEE • WISCONSIN • U. S. A.

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

NOT in the *Contract*

Warden: "What kind of exercise would you like to take?"

Condemned Man: "I'd like to skip the rope."

The tired core driller plodded wearily home. A hard day in the field. His last good tire had blown out. Arriving home, no odor of supper cooking. All quiet. A farewell note on the table from his wife. Then the phone rang and a neighbor informed him that his only daughter had run away with a sailor. "The last straw," he thought. "A shot would end it all." So he opened a bottle and took one.

Waiter: "May I help you with your soup, sir?"

Diner: "What do you mean, help me? I don't need any help."

Waiter: "Sorry, sir. From the sound I thought you might wish to be dragged ashore."

We are short on beef, but the supply of "beefing" is a little better than normal.

"We had a burglar break into our house last night."

"Did he get anything?"

"I'll say he did; the wife thought it was me."

"How in the world can a girl be happy without a husband?"

"Listen, beautiful, if he's out of town I'll show you."

"What sort of a chap is he?"

"He has a mechanical mind. He was over to see me last night and the lights went out and he spent the whole evening trying to fix them."

Frantic voice on phone: Help, a robber just broke into the old maid's home.

Cop: Who's this calling?

Voice: The robber.

Do you believe in clubs for women?

Yes, but only after kindness fails.

"No! It isn't me!"

The Wrong Man

A salesman, seeking to register at a small-town hotel, was told there were no rooms left. "But can't you manage to put me up somewhere?" he pleaded. "I'm leaving first thing in the morning."

The night clerk scratched his head. "Well, there's an extra cot in Colonel Twitchell's room," he relented. "He's an old customer and probably would not mind if you tiptoed out and didn't disturb him."

"That's fine," the traveler said. "Just call me at seven. . . ."

The following morning, bright and early, he crept out of the room and hurried down to pay his bill. To his surprise, the elevator man nodded to him politely. "Good morning, Colonel Twitchell." At the desk, the clerk smiled: "Good morning, Colonel Twitchell." Bewildered, he hurried across the lobby, past a scrubwoman, who looked up and wished him "Good morning, Colonel Twitchell." Taking a grip on his sanity, he hailed a cab. "To the station!" The driver nodded, "O. K. Colonel Twitchell."

At the station the ticket agent said, "Leaving for the city, Colonel Twitchell?" With a groan he staggered back from the window and, for the first time, he saw his reflection in the mirror of a slot machine.

"My God," he gasped, "they woke up the wrong man!"

Doctor: "What you need, my dear young lady, is a little sun and air."

Sweet Young Thing: "Why, Doctor, how dare you! Why, I'm not even married."

1st Gal: "So Harry is teaching you how to play ball?"

2nd Gal: "That's right; and when I asked him what a squeeze play was, I think he put one over on me."

Sweet Young Thing: There is a rat in my room.

Hotel Clerk: Make him come down and register.

You have all heard of the Scotchman who wouldn't buy his girl a parasol when he took her to the beach, but told her shady stories instead.

She was only a grave digger's daughter, but you ought to see her lower the beer.

ON Victory's STARTING Line

● Rear-Dump and Bottom-Dump EUCLIDS may not capture any enemy positions or win any battles, but the jobs they are doing here and overseas help provide our armed forces with the raw materials for victory.

It's on victory's starting line — the open pit mines, quarries, power dams, army and navy bases, airports, cantonments, armament plants, ordnance depots, etc. — that Euclid speed, capacity and dependable performance have been called upon to complete tough jobs in record time and at lower cost per ton or cubic yard. Present deliveries are confined to high priority orders, but we're ready to help with your plans for after victory requirements.

The EUCLID ROAD MACHINERY Co., Cleveland, O.

EUCLID

SELF-POWERED
HAULING EQUIPMENT
For EARTH . . ROCK . . COAL . . ORE

CRAWLER WAGONS • ROTARY SCRAPERS • TAMPING ROLLERS

EUCLID
THE PIONEER

For your convenience in writing to The Euclid Road Machinery Co., you will find a card bound in this issue.

Shots from the Firing Line

(*Continued from page 194*)

City, McPherson, Newton, Wichita.

KENTUCKY — Covington, Earlington, Elizabethtown, Frankfort, Hopkinsville, Lexington, Louisville, Madisonville, Olive Hill, Paducah, Pikesville, Winchester.

LOUISIANA—Baton Rouge, Hammond, Lake Charles, New Orleans, Opelousas, Ponchatoula.

MAINE—Augusta, Freeport Village, Pembroke Village, West Pembroke, Winslow.

MASSACHUSETTS — Boston, Gloucester, Palmer, Springfield, Westfield, West Springfield, Wilbraham.

MISSISSIPPI — Albany, Corinth, Meridian, Terry.

MISSOURI—Kansas City, St. Louis.

NEVADA—Las Vegas, Reno, Sparks.

NEW HAMPSHIRE—Concord, Manchester.

NEW JERSEY — Elizabeth, Jersey City.

NEW YORK—Albany, Buffalo, New York City, Rochester, Schenectady, South Amsterdam, Syracuse, Utica.

NORTH CAROLINA — Charlotte, Clinton, Greensboro, Greenville, Highpoint, Thomasville, Wilson.

OHIO—Akron, Cincinnati, Cleveland, Columbus, Lima, Mansfield.

OREGON—Portland.

PENNSYLVANIA—Pittsburgh.

WASHINGTON — Mount Vernon, Olympia, Seattle.

WEST VIRGINIA — Morgantown, Thomas.

Brady P. Gentry, chairman of the Texas State Highway Commission and president of the association told General Fleming that expenditure of $1,000,000,000 yearly in highway construction would give work for a year to approximately 750,000 men, besides rehabilitating, improving and expanding the highway system.

"The success," he said, "of such a proposed program in the three-year period immediately following the war, must wholly depend on having sufficient and entirely complete plans ready when hostilities end . . . It must be remembered that before contracts can be let for highway construction aggregating $1,000,000,000 the State Highway Departments must make surveys, secure rights of way and draft detailed plans, at a total cost of approximately $200,000,000."

Besides Gentry, the delegation was composed of:

Fred R. White, Chief Engineer, State Highway Commission, Ames, Iowa; T. H. Cutler, State Highway Engineer, Frankfort, Ky.; J. S. Williamson, Chief Highway Commissioner, Columbia, S. C.; Samuel C. Hadden, Chairman, State Highway Commission, Indianapolis, Ind.; C. W. Brown, Chief Engineer, State Highway Commission, Jefferson City, Mo.; Geo. H. Henderson, State Highway Engineer, Providence, R. I.; Gen. James A. Anderson, Commissioner of Highways, Richmond, Va.; H. A. MacDonald, Commissioner of Public Works, Boston, Mass.; C. W. Phillips, Commissioner of Highways, Nashville, Tenn., and Frederic E. Everett, Commissioner of Highways, Concord, N. H.

Krug Named in Charge of WPB Materials Distribution

J. A. Krug, director of the office of war utilities, was named by Chairman Donald M. Nelson and Charles E. Wilson, executive vice-chairman of the War Production Board, as vice-chairman of the WPB in charge of materials distribution. He also becomes chairman of the requirements committee and will continue to serve as war utilities director.

Mr. Krug, whose home was in Madison, Wisconsin, before he entered government service, was formerly director of power for the Tennessee Valley Authority. He was appointed head of the power division of the Office of Production Management in the summer of 1941, and held the same position with WPB until he became deputy director general and head of the distribution bureau last August. He was appointed director of the office of war utilities last month.

President Approves Columbia Basin Project Act

President Roosevelt has approved the Columbia Basin (Washington) Project Act passed by the Congress to prevent speculation in lands under the world's largest irrigated agricultural development. The irrigation facilities when constructed by the Bureau of Reclamation of the Department of the Interior, will be served with water diverted at Grand Coulee Dam. Grand Coulee Dam already is producing a great block of power for war industries, distributed through the Bonneville system.

In calling attention to the approval of the act, Secretary of the Interior Harold L. Ickes said:

"The President has long been interested in the development of Grand Coulee Dam and the Columbia Basin project, and initiated construction under the Public Works program in 1933."

The secretary, commenting on the almost universal support of the project, said, "The bill was passed unanimously by the United States Senate and with only one dissenting vote in the House of Representatives. It has been endorsed by the irrigation districts which will be served by the project and ratifying and consenting legislation is before the Washington State Legislature in session at Olympia.

"The Columbia Basin Project will be to irrigation in the West what Grand Coulee Dam is in the field of power—the greatest undertaking of its kind in history," Secretary Ickes said. "Our plans for the irrigation development have been advanced under Commissioner John C. Page so that the project could be included in a war food construction program, if required, or in a post-war program to cushion the shock of the transition to a peacetime economy in the Pacific Northwest. This Act protects the investment of the Government and will insure that the irrigated land is placed in the hands of bona fide settlers at fair prices."

The Columbia Basin project includes 1,200,000 acres of productive land. When completed it is expected to provide support for from 25,000 to 30,000 families on farms and in the towns and villages that will follow in the wake of the irrigation development.

All of the land in the project has been appraised by boards under the anti-speculation act of 1937. The bill provides the mechanics for preventing the sale of land by individual owners above

"TAXIES" for Hell Buggies
ARMY E NAVY
Tanks move doggedly forward wreaking havoc on the enemy but their speed is necessarily slower than trucks and their span of continuous service considerably more limited.
So they crawl up on Rogers Trailers and are moved quickly to the line of combat—or from it when repairs or reconditioning becomes necessary.
Thus, the effectiveness of an important combat unit is increased manifoldly by these non-combat vehicles.
ROGERS
LOW BED-HEAVY DUTY
TRAILERS
ROGERS BROTHERS CORP.. ALBION, PENNA.

For your convenience in writing to Rogers Brothers Corporation, you will find a card bound in this issue.

GIVE THE ENGINE A BREAK!

WHATEVER type of "Caterpillar" Diesel equipment you operate, it's powered by a great engine. Thousands of veteran "Caterpillar" units are doing a heroic job in these trying times—carrying on with sturdy efficiency long after their ordinary life span.

It's the many *extra* qualities built into all "Caterpillar" Diesel Engines that are proving their worth today. They're simple, dependable, as nearly free from operating adjustments on the job as possible. But if you expect to get the utmost out of your engine, it's up to you to do *your* part.

FIRST OF ALL, YOU SHOULD READ THE INSTRUCTION BOOK AND RE-READ IT

Lubrication is important to engine life. Use the correct grade of oil, and be sure to change the oil and filters at proper intervals, as indicated by the hour-meter.

Don't forget to keep the fan belt properly adjusted.

See that the cooling system is tight, and put in enough anti-freeze to give positive protection in winter.

Keep the air-cleaner clean, and remember it needs more attention if dust conditions are bad.

Keep the clutch properly adjusted to avoid slippage, and don't overload the machine oftener than is absolutely necessary.

When repairs or special adjustments are needed, your "Caterpillar" dealer is ready day or night to help keep your engine working. He is equipped for every type of service.

He'll install new rings or recut piston ring grooves and put in wider rings if grooves are badly worn.

He'll etch cylinder liners, removing gum and glaze.

He'll replace bearings when they are worn, and he is equipped to recondition a worn crankshaft and fit it with new bearings, saving many pounds of war-needed metal.

Have him test your fuel injection system to see if it is functioning properly.

The "Caterpillar" dealer is the best friend your "Caterpillar" equipment has. Wartime conservation of power and materials is his job and he's doing it well. You can count on his sound advice and reliable service, now and at all times.

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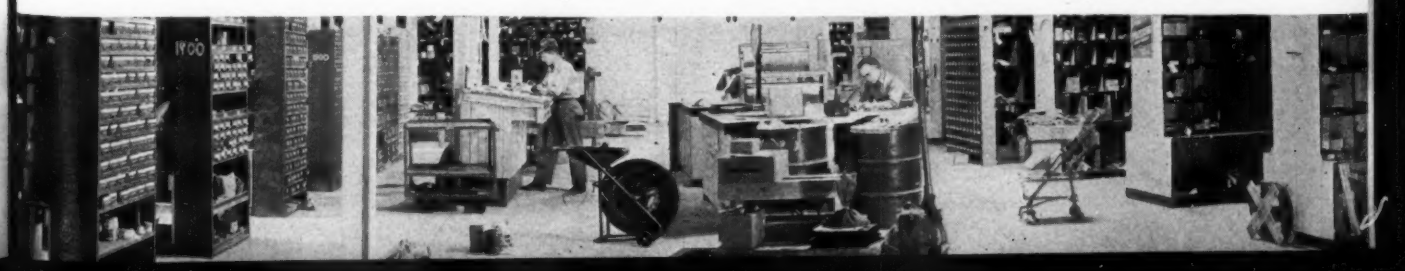
CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

TO WIN THE WAR: WORK—FIGHT—BUY WAR SAVINGS BONDS!



the appraised prices. Safeguards against speculation are given to purchasers.

Farms shall have a lower limit of 10 acres and an upper limit of 160 acres on their size and will be laid out on farm unit plats arranged so that each unit will be of sufficient size to support decently a farm family.

Land in excess of a farm unit held by any one landowner may be acquired by the Secretary at the appraised values and resold by him to settlers.

To assist in the permanent settlement of farm families, facilitate project development, and prevent speculation, the Secretary is authorized to sell, exchange or lease project lands, to establish town sites, to dedicate portions for public use and to acquire in the name of the United States, lands within or adjacent to the project area for the protection, development or improvement of the project.

New England Coal Requirements

New England Anthracite coal requirements for 1943 are expected to exceed substantially the 1942 deliveries of 7,093,000 tons. Bituminus coal requirements for New England are estimated at 27,000,000 tons, compared with 1942 deliveries of 23,189,000 tons. More than one-half of the bituminous coal and nearly all of the anthracite coal for New England is now expected to move by all-rail routes, the remainder moving by water from New York and Hampton Roads.

Schedule Access Roads to Mines and Quarries

To satisfy the need of America's war industries for raw materials, more than 2,850 miles of access roads to mines, quarries, and forests have been scheduled for construction, Commissioner Thomas H. MacDonald, of the Public Roads Administration of Federal Works Agency, announced.

By March 1 of this year roads of this type had been approved for construction to cost about $9,000,000, MacDonald said. A hundred miles of such roads were completed in 1942 at a cost of $346,000. These access roads to sources of raw materials are exclusive of the access roads to military establishments and industrial plants.

Most of the roads to mines, quarries and forests are shaped with a bulldozer and surfaced with gravel at relatively small expense.

Deposits of 28 different minerals, metals, and rare elements are tapped by these roads at about 225 locations in 22 States and Alaska. The access road in Alaska, nine and one-half miles long and costing $93,500, gives access to a chrome mine.

Other access roads serve mines of chrome, and of antimony, asbestos, bauxite, beryl, calcite, coal, cobalt, copper, cupric scheelite, fluorspar, garnet abrasive, graphite, iron, lead, manganese, magnesite, mercury, mica, nickel, rutile, stibnite, spodumene, talc, tungsten, vanadium, vermiculite, and zinc. Connections are also made with timberlands.

Make Plans Now for 'Express Highway' of Future

Twelve States already have the necessary laws and seven others are now considering legislation that will enable them to build the express "highways of tomorrow" when peace comes, Commissioner Thomas H. MacDonald of the Public Roads Administration of the Federal Works Agency announced.

These future highways were described as "limited-access roads designed to serve through traffic rather than abutting property." The Pennsylvania Turnpike and the Merritt Parkway in Connecticut are early examples. Traffic is permitted to enter and leave them only at certain selected points. These particular highways are toll roads, but limited access is contemplated, for the future, for non-toll roads as well.

"Many states cannot now build these advanced motorways," Commissioner MacDonald pointed out, expressing the hope that they will enact enabling legislation so that advance planning can begin. He added:

"Statutes limiting road widths inherited from the horse-and-buggy days,

DRAGLINE BUCKETS AVAILABLE
for . . . IMMEDIATE DELIVERY

Six —	¾-cu. yd.	Type AU,	light-weight Bucyrus-Erie buckets, weight	1,500 lbs.
Five —	1-cu. yd.	Type AU,	light-weight Bucyrus-Erie buckets, weight	1,850 lbs.
Four —	1¼-cu. yd.	Type AU,	light-weight Bucyrus-Erie buckets, weight	2,250 lbs.
Four —	1½-cu. yd.	Type AU,	light-weight Bucyrus-Erie buckets, weight	2,500 lbs.
Three —	1¾-cu. yd.	Type AU,	light-weight Bucyrus-Erie buckets, weight	3,100 lbs.
Six —	2-cu. yd.	Type AU,	light-weight Bucyrus-Erie buckets, weight	3,500 lbs.
One —	2¼-cu. yd.	Type AU,	light-weight Bucyrus-Erie bucket, weight	4,000 lbs.
One —	2½-cu. yd.	Type AU,	light-weight Bucyrus-Erie bucket, weight	4,250 lbs.
One —	4-cu. yd.	Type AU,	light-weight Bucyrus-Erie bucket, weight	6,850 lbs.
One —	4-cu. yd.	Type Y,	heavy-duty Bucyrus-Erie bucket, weight	11,500 lbs.
One —	7-cu. yd.	Type W,	medium-duty Bucyrus-Monighan bucket, weight	13,700 lbs.

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PARTS DEPT. SO. MILWAUKEE, WISCONSIN, U.S.A.

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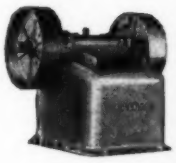
The Care and Maintenance of Rock Crushers



Only Universals feature strong, light, streamlined bases.

No. 3 of a series of advertisements in the interests of national economy and to aid those users of crushing equipment unable to secure new units during the emergency.

The "Do and Don't" of Crusher Lubrication

Today lubrication is more important than ever before. Lack of grease can cause costly bearing failures and bearings are made of vital, much needed alloys.
These ten simple rules, strictly observed, will help your crusher to stay on the job until the day when parts are plentiful and new crushers obtainable.

1. Don't keep lubricant containers near crushing plant—as float dust is penetrating and a little grit in your grease may ruin a bearing.
2. Don't put oil or grease in bearings or fittings until they have been wiped off with clean rags. Flush them with a thin oil—don't use kerosene.
3. Use only clean containers.
4. Make it a practice to inspect bearings often—at least four times daily with bronze bearings; once daily with roller bearings—checking them for over-heating.
5. Don't use cheap lubricants—they cost more in the long run. Use only tested lubricants as indicated on name plate.
6. Place a burlap bag saturated with crank case drainings on top of the lower end of the toggle—it helps keep out dirt and lubricates the lower toggle seat.
7. Keep adjustment wedges and screws clean. Oil regularly to prevent rust. Unless already enclosed, wrap screws with cloth, tied on, to keep out grit.
8. Squirt out a shot of grease from gun before greasing to clean nozzle.
9. Don't over-oil or grease. Too much lubricant can overheat bearings. Bearings have to "breathe" but should be able to contact grease. Use thinner lubricant in cold weather. Notice oil level plugs or name plates indicating quantity to use.
10. Don't keep adding oil when it should be changed. Changing gets rid of any dangerous accumulation of dirt.

EVERYBODY EVERY PAYDAY AT LEAST 10%

We're 100% Ten Percenters!

UNIVERSAL ENGINEERING CORP., Formerly UNIVERSAL CRUSHER CO.
610 C Avenue West, Cedar Rapids, Iowa

UNIVERSAL

CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADEROLLERS, PORTABLE ASPHALT PLANTS

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for example, often prevent acquisition of adequate rights-of-way for the broad, uninterrupted arteries required by modern, high-speed vehicles.

"Limited-access facilities are also unattainable without special legislation because of the common-law right of access of abutting property owners to a public highway. Even when a heavily traveled road is located through an undeveloped area, it is soon lined with a variety of establishments, each one exercising its right of direct entry. Driving down this busy avenue then is like running the Indian gantlet of pioneer days. Only by law can access be limited and a highway made safe and suitable for modern traffic."

States now legally prepared to construct limited-access highways are, California, Colorado, Connecticut, Louisiana, Maine, Maryland, Michigan, New York, Ohio, Rhode Island, Virginia and West Virginia.

California and New York are actually developing detailed plans and specifications for limited-access highways for post-war construction. This advance engineering work is a joint Federal-State undertaking which is being financed from a special $10,000,000 fund authorized in the Defense Highway Act of 1941 and from State funds.

States with limited-access highway legislation under consideration include Arizona, Delaware, Massachusetts, New Hampshire, New Jersey, New Mexico and Utah.

A draft of a model limited-access highway law has just been prepared by Public Roads Administration. This will be distributed to all state highway departments, it was announced.

"We hope many more states will enact limited-access highway legislation so that advance planning of these modern facilities can begin," Commissioner MacDonald said. "Some of the existing laws should also be revised to incorporate all the best features of this type of legislation.

"The model law is in reality a composite of the best portions of existing state laws. Every thought and clause in it may be found in the laws of one or more of the 12 states which have such legislation."

The model act defines two types of limited-access roads: parkways, from which trucks, buses, and other commercial vehicles are excluded; and freeways, which are open to all traffic.

It stipulates that cities and other subdivisions of government as well as the State shall have authority to establish such facilities.

It authorizes the division of these facilities into separate roadways for each direction of travel, and prohibits access from abutting lands except at designated points.

It provides for acquisition of sufficient right-of-way for the facility itself and associated service roads, including "rights of access, air, view, and light."

It gives highway authorities power to designate existing streets or highways as limited-access facilities; with the consent of the government unit concerned, to eliminate existing intersections by means of grade-separation structures or closure; and to provide necessary local service roads separate from the limited-access facility.

Fennelly Directs Program of WPB Materials Distribution

Appointment of John J. Fennelly as director of the program bureau was announced by J. A. Krug, WPB vice-chairman for materials distribution. Mr. Fennelly will continue to serve as vice-chairman of the requirements committee and chairman of the program adjustment committee.

In his new position Fennelly will replace Donald D. Davis, who was recently named WPB vice-chairman for operations.

The new director of the program bureau has been with the War Production Board since January, 1942, when he became special assistant to J. S. Knowlson, who was then director of industry operations. Mr. Fennelly was named chairman of the end products committee in April, 1942, and vice-chairman of the requirements committee in July. He was formerly a partner of Glore, Forgan and Company, of New York and Chicago. His home is in Chevy Chase, Maryland.

BEWARE of Wire Rope "Gremlins"

GREMLINS—those sly imps who delight in bedeviling our flying forces—will also get your wire rope if you don't watch out.

The way to combat these little trouble-makers is to give your wire rope constant and proper care. Be on the alert at all times. *Guard especially against the following conditions, which are common causes of premature wire rope failures:*

1. Improper or insufficient lubrication
2. Using wire rope of incorrect size, construction or grade
3. Improper selection of sheaves
4. Improper care of sheaves
5. Sheaves out of line
6. An inadequate factor of safety
7. An excessive fleet angle
8. Sudden jerks or pulls
9. Kinking

The importance of using all means and methods of increasing wire rope efficiency—thereby saving steel for other vital purposes—cannot be overemphasized. Our experienced Engineering Department is at the service of all wire rope users. Feel free to write us about any wire rope problem which may be giving you trouble.

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WIRE ROPE MAKERS — ESTABLISHED 1857
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HERCULES Wire Rope

For your convenience in writing to A. Leschen & Sons Rope Co., you will find a card bound in this issue.

We take lessons from you

Chan!

YOURS is a weary task and a bleak existence, Chinese friend, as you toil on a highway for the inhuman Japs. They think themselves your masters—but they're not! For they can't enslave your soul, or break your patience, or kill your will for final victory. We take a lesson from you, Chan, as you look down the highway where victorious armies will march — your armies and ours.

For the war is over here, too—on sea and land, above and below. In open pit mines and quarries skilled men are drilling and blasting coal and ore and stone with which a war is won.

To speed the work of these determined men, and to provide for their safety, the Ensign-Bickford Company is manufacturing Safety Fuse and Primacord-Bickford Detonating Fuse.

Victory Begins Underground!

D-P

THE ENSIGN-BICKFORD CO.
SIMSBURY, CONNECTICUT

For your convenience in writing to The Ensign-Bickford Company, you will find a card bound in this issue.

Operating Efficiency

(Continued from page 175)

dles, ropes, booms and dippers could be readily broken. It is important, therefore, to have experienced operators. Breaking in new operators should be done carefully and slowly to give the man a chance to gradually become accustomed to the feel and action of the machine. An apprentice who is placed in production operation too soon, may be fortunate by not experiencing an accident. He may be considered a careful apprentice, yet may in the course of training, overstress a member. Such overstressed members may not fail at the time of injury. On such jobs where operators are rotated the injury may fatigue to complete failure at the time some experienced operator is at the controls. This usually develops in a confusion of reasons for the cause of the failure.

Every operator should have an idea of the forces he is controlling. He should know how these forces are taken by the machine, and he should know the influence that overload and impact loads have on the total work done by the machine. This knowledge would enable him to utilize the digging forces with more effect and with less duty on the machine.

An experienced shovel operator, after running a machine in a certain pit, soon knows what he can do with it on this job. He knows that he can fill the dipper at a certain rate and that the ability to carry the dipper through the cut is the digging effort which he controls. This digging effort is the force in excess of lifting the dead weight of the dipper and handle exerted by the bail pull. It is determined by moments which are the forces acting at certain lever arms as illustrated in Figure No. 1.

The downward dead weight moment of dipper and handle is the weight of these members multiplied by the distance or lever arm (a) from the shipper shaft to the center of gravity of these combined weights. The upward moment is the bail pull multiplied by the normal lever distance (b) from the shipper shaft to the line of bail pull. Subtracting the downward moment from the upward moment leaves a net upward moment which, if divided by the distance from the shipper shaft to the teeth, determines the digging effort at the teeth. If the bail pull remains the same during the full digging stroke the digging effort would constantly change with the changing length of levers (a), (b) and (c). This perhaps does not concern some operators because if stalling loads have not been reached they continue to apply more bail pull. Instead of applying power this change of effort should be used to advantage. If the digging effort changes for different positions of the dipper some practical position giving the best effort should be used. Figures No. 2 and No. 3 show a practical digging condition of a stripping shovel.

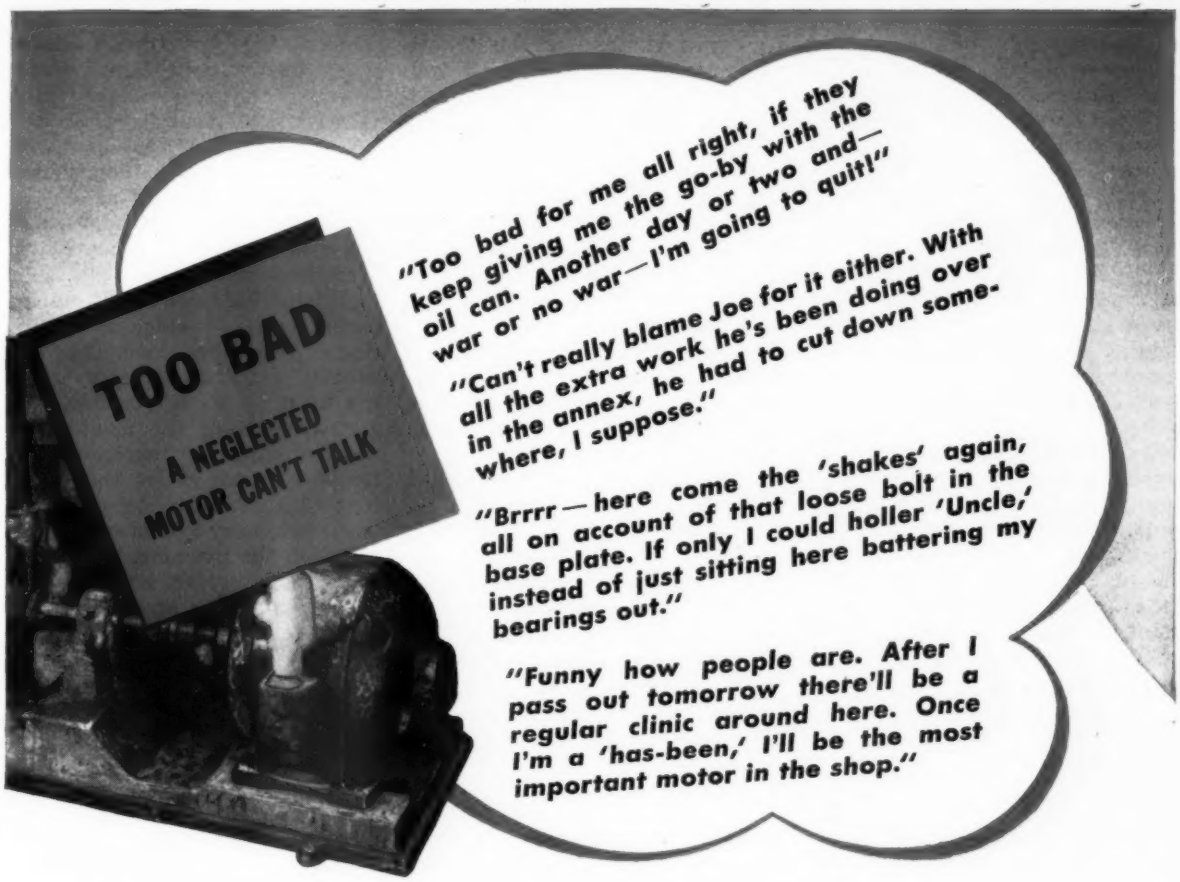
In this sketch No. 2 we have shown a stripper of the Bucyrus-Erie 750-B type. We have shown the dipper in two positions, position 1 is with the handle fully extended and position 2 being equivalent to moving the machine 20 feet closer to the high wall. Assuming a bail pull of 150,000 pounds in both positions and calculating the digging effort at the teeth as described through Figure No. 1, we find that we get a digging force of 30,000 pounds in position 1 and 52,800 pounds in position 2. This means that we can obtain 75% more digging effort with the same bail pull by taking advantage of the better relation of lever arms "a," "b," and "c" of Figure No. 1 for dead weights and bail pull. It is needless to say that the man who can get this greater digging effort out of his machine will rip out more rock and get greater yardage.

The effect on the stresses throughout the machine in working it in position 2 is decidedly noticeable from the figures indicated. In addition to getting 75% more digging effort the boom foot reaction is 8% less; the suspension tackle pull is 19% less; the A-frame load is 19% less; the backleg load is 19% less and consequently the stresses throughout the machine are correspondingly less.

The results shown were for the machine working at a bail pull of 150,000 pounds for both positions. There are conditions of digging, even in most rock banks, which do not demand as much digging effort. Usually there is a good section of loam on top, or a strata of softer shale, which is termed lighter digging. In these cases, and especially on a dirt bank, the required digging effort may be no greater than 30,000 pounds which is obtained as maximum when the handle is in the outer position. If we should demand a digging effort of 30,000 pounds in position 2 as indicated in Figure No. 3, we would require a bail pull of only 123,500 pounds which is 21% less.

Comparing the two conditions in sketch No. 3 of position 1 with the 150,000 pound bail pull and position 2a with 123,500 pounds bail pull, we obtain a reduction in stresses for position 2a of 12½% in boom foot reaction, 28% in suspension load, 28% in the A-frame load, and 27% in the backleg load. Working as close to the bank as is practical for cleaning up the floor as in position 2a, not only reduces the stresses in the machine but it improves the general efficiency of the digging operation. It improves the stability of the machine as the digging forces are closer to the machine giving a smaller forward turn-over moment. The hoist rope leading in from the boom point sheave gives a thrusting out component to the hoist pull which requires less thrusting effort with the thrusting machinery. These better digging conditions mean fewer passes for a given yardage which eases the effort of the operator and machine. With smaller loads imposed on the member the stresses become correspondingly smaller, which is bound to reduce maintenance and consequently contribute to increase of output and efficiency.

The results of these reduced front end loads are not confined to the deck of the revolving frame. The boom foot reactions and A-frame reactions carry down through the base and roller circle and then to the cats. It avoids such conditions as lifting the rear end of the machine when high bail pulls are used. Lifting the rear end of the machine always has a destructive result of high


TOO BAD
A NEGLECTED MOTOR CAN'T TALK
"Too bad for me all right, if they keep giving me the go-by with the oil can. Another day or two and—war or no war—I'm going to quit!"
"Can't really blame Joe for it either. With all the extra work he's been doing over in the annex, he had to cut down somewhere, I suppose."
"Brrrr—here come the 'shakes' again, all on account of that loose bolt in the base plate. If only I could holler 'Uncle,' instead of just sitting here battering my bearings out."
"Funny how people are. After I pass out tomorrow there'll be a regular clinic around here. Once I'm a 'has-been,' I'll be the most important motor in the shop."

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To get the most out of motors, and to meet new WPB requirements, the required horsepower for every job must be accurately known. On metal-cutting operations, the new G-E MOTORULE is just what you need to determine your requirements. Simple to use, it saves time and saves motor horsepower. Ask for GEL-763.

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roller loads and pintle wear. This is especially true for the cats because the rocking action of the cat rollers on the tread belt caused by reaction of the dipper thrust entering the bank is under much lighter loads imposed by lighter boom foot and A-frame foot reactions.

Of course, there are operating conditions, either demanded or existing, that make it impossible for a shovel operator to employ digging methods which are best for the machine. In stripping work some operations make it advisable to have wide berms to favor haulage, other pits are planned to have the haulage pass between the machine and the high wall. In quarry work when digging a face higher than the point of the boom it is necessary to keep back from the face far enough to clear the boom point sheave. These conditions require operation with a long handle. However, the principle of working close to the high wall face and with a short handle should be used whenever possible.

Practical Limits of Shovel

In addition to knowing the foregoing facts about the ability of the machine, it is also well to recognize the limits of range, load, swing speed and uneven floor conditions for the caterpillar support. The limit frequently exceeded and causing greatest overload of the machinery parts is the range of the machine. Each machine has a definite range as determined by the boom and handle. There is, of course, a maximum range for all machines but this maximum range cannot be considered a good economic and practical point at which to work continuously. It is true that each shovel can hoist a load equivalent to a loaded dipper to the maximum high lift of block to block where interference with the boom point sheave limits further hoisting. At this elevation the crowd machinery is exerting maximum thrusting force in placing the handle with this load to the extreme outer stop. This condition demands a heavy bail pull because the line of the bail pull is in a direction which must counteract the thrusting force. In other words, the two forces counteract each other, requiring a heavy bail pull and creating a maximum backward thrust for the crowd machinery and center of the boom. Constant operation like this calls for higher average loads and like all types of machinery, if constantly utilized to the maximum capacity, it will result in high maintenance costs.

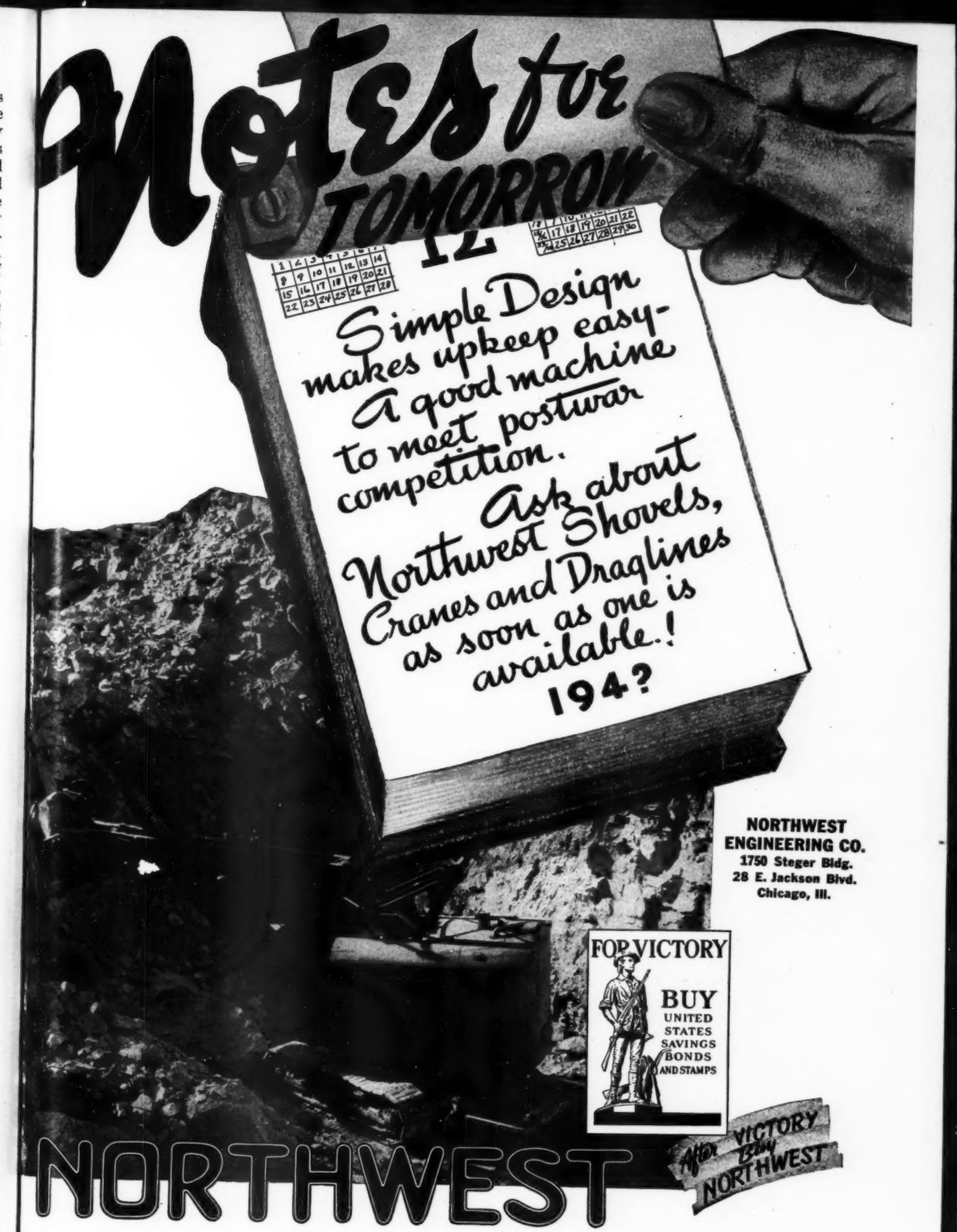
The usual operating range for a shovel is to dig off the floor or in a zone below the height of the shipper shaft. However, frequent occasions arise where the machine does its work against a high face with boulders, imbedded rocks or deep frost at high elevations as indicated in Figure No. 4.

To dislodge boulders imbedded at high elevations naturally requires a high bail pull. Usually the dipper is braced under the rock and the operator proceeds to pull. The crowding motion is applied in addition in order to loosen the rock. Failing to loosen the rock in this manner some operators employ the third function of the machine and proceed to swing the machine to set a sidewise pull on this rock. It is to be noted in Figure No. 4 that digging in position 1 the center of gravity of revolving parts is 2.3 feet to the rear of the front roller circle roller. In position 2, with maximum crowd-in force applied the center of gravity, the load is forward of the caterpillar center line which is a tipping condition. This type of operation is very destructive to the machine, it causes the machine to tip forward and throws the entire weight of the machine onto the front circle rollers and down onto the caterpillar rollers. This concentration of loading, combined with the rolling action frequently applied, causes a fatigue breakdown of the bearing surfaces of these parts. Also, the side load developed by swing against such rocks is very destructive to the handle and boom. Some operators endeavor to dislodge such rocks by digging around them. However, the proper way to remove them is by complete preparation of the bank and not by overloading the machine to do this work.

A machine is designed to handle a load equal to the load of the dipper plus the material in the dipper and to swing this load at a predetermined speed to give a good cycle for the machine. It is frequently necessary to handle larger loads than determined by the size of the dipper. Large pieces of rock are sometimes blasted down to the floor of the pit and must be picked up by the machine and set to one side for secondary blasting so that excavation of normal size pieces can be continued. Sometimes these large pieces of rock, when balanced on the dipper, develop a load which is double that of the normal load. They are usually placed as far away from the machine as is possible, frequently causing the machine to tip. Swinging the machine when tipped forward shifts the heavy concentrated loads to one side when the heavy load is stopped by plugging the machine. The entire machine is under heavy strain during this time and every care should be taken to make the operation smooth and slow to avoid sudden shifting of loads or impact loading. When handling the machine under these conditions it should be regarded as a crane instead of a shovel and the hoisting and swinging loads should be slowly applied as in actual crane work. In other words, as the machine is required to work under heavier stresses than for normal operation, the speed must be reduced to obtain smooth motion and avoid all impacts.

Swinging should never be employed while the dipper is still in the bank during the digging stroke. The shovel is designed for a digging stroke in line with the centerline of the machine. Any side forces applied while the handle and boom are stressed under the digging load introduces heavier loads on one side and it is quite possible to over-stress the front end of the machine to a point of fatigue if this kind of operation is continued. Neither the handle nor the boom is designed to continually take side digging loads. The swinging function is the transporting part of the cycle and the machine is designed to take the side forces introduced when starting and stopping the swing transportation of the normal load of a loaded dipper. The operation of swinging while the dipper is still in the digging part

(*Continued on page 212*)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After VICTORY Buy NORTHWEST

• The finished product of the Reynolds Pit is loaded from a twin elevated chute into waiting gondolas.

Sand of Modern Times

(*Continued from page 173*)

car loader for loading. There are 1,100 feet of conveyor in the Reynolds Pit. Boston, Cincinnati, and Goodyear belting is used

In blast hole drilling operations in the Reynolds Pit the average depth of face is 68 feet for the first level, 16 feet for the second level and 14 feet for the third level, or a total of 98 feet. The American Silica-Sand Company never drills less than the average depth of face. The diameter of the blast holes is 4½ inches and the pattern of the holes changes with the formation to be drilled. Bits are changed about every 70 feet and are resharpened in the company's own blacksmith shop. The number of holes per blast ranges from an average of four to a maximum of twelve. The approximate tonnage brought down per blast varies according to level; top level, 12,000 to 30,000 tons; second level, 3,900 to 5,800 tons; and third level, 1,000 to 3,000 tons. The ratio of the explosive to the material moved varies because of changes in formation. No secondary blasting is necessary in this pit.

Higby Canyon Pit Operations

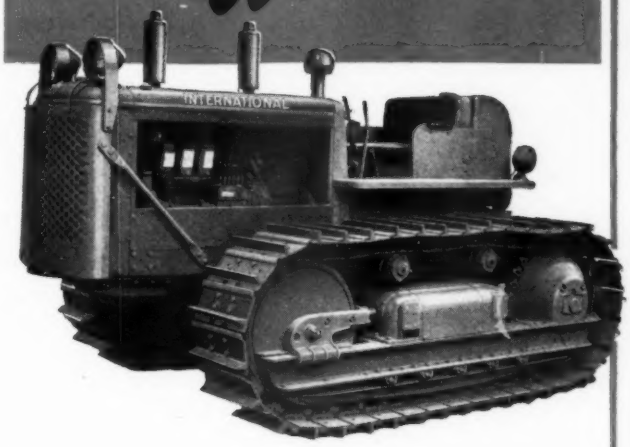
The third pit operated by The American Silica-Sand Company is the Higby Canyon, a pit with an area of 146 acres and with a depth of overburden averaging five feet, with a maximum of nine feet. The average depth of rock in this pit is 65 feet with a maximum of 98 feet. Approximately 40,000 yards have already been stripped in development of the Higby Canyon Pit.

The production rate for an average 8-hour shift in the Higby Canyon Pit is 32 cars or 2,000 tons. The maximum production in this pit for ten hours is 40 cars or 2,500 tons.

Equipment used for drilling, loading and hauling in the Higby Canyon Pit is as follows: two traction Loomis blast hole drills; two Gardner Denver air hammer drills; one type WN 11-B National Brake and Electric Company portable air compressor; one Marion type 371 1¾-yard gas shovel; one Link-Belt K-44; one ½-yard gas dragline; one Bucyrus-Erie 1-yard gas-air dragline; one 12-ton Plymouth gas locomotive; one 10-ton Plymouth gas locomotive; sixteen 5-yard 36-inch gauge two-way Western dump cars; one 27″ x 42″ Stephens-Adamson corrugated double roll crusher; one 24″ x 30″ Stephens-Adamson smooth double roll crusher; one 24-inch belt conveyor 58 feet long; four 36″ x 60″ scalping gravity screens; two 42″ x 60″ Roberts & Schafer vibrating screens; one Venn-Severin 60 hp. diesel engine; various gas engines, pumps and other necessary production and loading equipment.

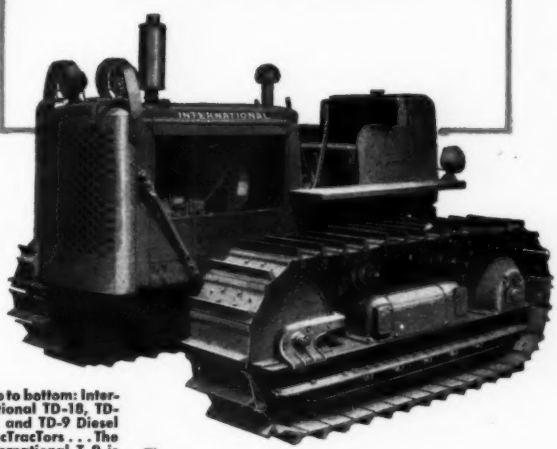
After blasting operations in the Higby Canyon Pit the sand is picked up from the top level by a Marion shovel, from the second level by the Link-Belt dragline, and from the third level by the Bucyrus-Erie dragline. This sand is loaded into a 5-yard Western dump car and is then transported by a Plymouth locomotive to a receiving bin of 200 tons capacity, then by feeder to a 24-inch belt conveyor to scalping screens. The oversize material then passes through the 27″ x 42″ corrugated double roll crusher and this crushed material passes over the two Roberts & Schafer 42″ x 60″ vibrating screens. The oversize from these Roberts & Schafer vibrating screens passes through

OUR "1943 Models" Are Dedicated to Victory



INTERNATIONAL
VICTORY TracTracTors

Built to Victory Specifications—for Release to Users on Essential Construction Work



Top to bottom: International TD-18, TD-14, and TD-9 Diesel TracTracTors . . . The International T-9 is not shown.

NORMALLY International Harvester would be announcing new 1943 International TracTracTors about this time of year. But this is wartime, and traditional "new models" have been discontinued for the duration.

Just the same, there's a great line of TracTracTors rolling off the assembly lines. We call them Victory TracTracTors. They're all built to Victory (military) specifications. Most of them are going to the Armed Forces. A limited number are available for civilian use on *essential construction jobs.*

Users who qualify for these Victory TracTracTors get machines equipped as shown here. Much of this equipment is normally considered as "attachments." Today it is "standard." These tractors are frozen in design, and users get the benefit of *extra equipment to do essential war-winning jobs.*

Ask the International Industrial Power dealer about Victory TracTracTors and your eligibility. Meanwhile, take good care of the Internationals you have. Rely on International Service to help keep them operating efficiently. Work out a systematic preventive maintenance program with the International dealer. Yours for Victory.

INTERNATIONAL HARVESTER COMPANY
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POWER FOR VICTORY

INTERNATIONAL HARVESTER

BUY MORE WAR BONDS

For your convenience in writing to International Harvester Company, you will find a card bound in this issue.

• Crude silica sand on its way to crushing and screening operations at the Reynolds Pit, before being loaded into gondolas for shipment.

the 24" x 30" smooth double roll crusher and then back over the vibrating screens until all oversize is reduced. The sand passes on a shuttle conveyor to gondola cars on either of two tracks. The conveyor in the pit is 58 feet long and has Goodyear belting.

The depth of face for blast hole drilling operation in the Higby Canyon Pit averages 32 feet at top level, 22 feet at second level, and 14 feet at third level. Air drills are used at the third level. The blast holes are 4½ inches in diameter and the air hammer holes are 2⅝ inches. The pattern of holes in this pit also changes according to the formation to be drilled. The blast hole bits are changed every 70 feet and jack bits are used on the air hammers. As in the other two pits, the blast hole bits are resharpened in the company's blacksmith shop and jack bits are not resharpened. On an average there are 12 holes per blast at top level, four holes per blast at the second level and 18 holes per blast at the third level. Approximately 15,000 tons of material are brought down per blast at the top level, 2,400 tons at the second level, and 2,000 tons at the third level. There is no method of determining the ratio of explosive to the material moved in this pit because of the variation due to the change in formation. Secondary blasting is very seldom necessary in this pit.

Do Own Repair Work

The American Silica-Sand Company does all of its own cutting, its own repair and machine work, and about two-thirds of its welding, and of course, purchases necessary repairs and replacements from the manufacturers of the various units of equipment which are used and owned by the company.

The operating season of the Ottawa and Higby Canyon pits is from March 1 to December 1 each year. The Reynolds unit operates the year around to serve those customers of The American Silica-Sand Company who find it impossible to store sufficient quantities in September, October, and November of each year for the winter's requirements from December 1 to March 1. During the operating season approximately 60,000 tons of sand are produced monthly although the three units produced as high as 85,000 tons monthly late in the season.

Superintendent Waters, is now general operating head of the company for all three plants. Foremen at the three units are: Ottawa, Thomas Ruyle; Reynolds, Leo Bray; Higby Canyon, Albert Wilkinson.

President Niesen is a pioneer in the Ottawa, Illinois, district and was in charge of operations for the old Reynolds Sand Company since 1914. He became head of the present American Silica-Sand Company in 1937 after serving as general superintendent from the time the company was organized in 1928.

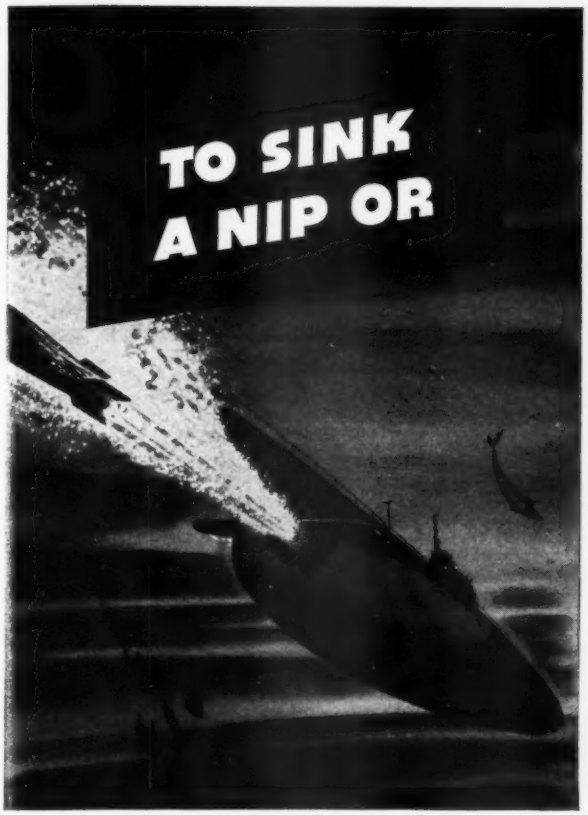
Operating Efficiency

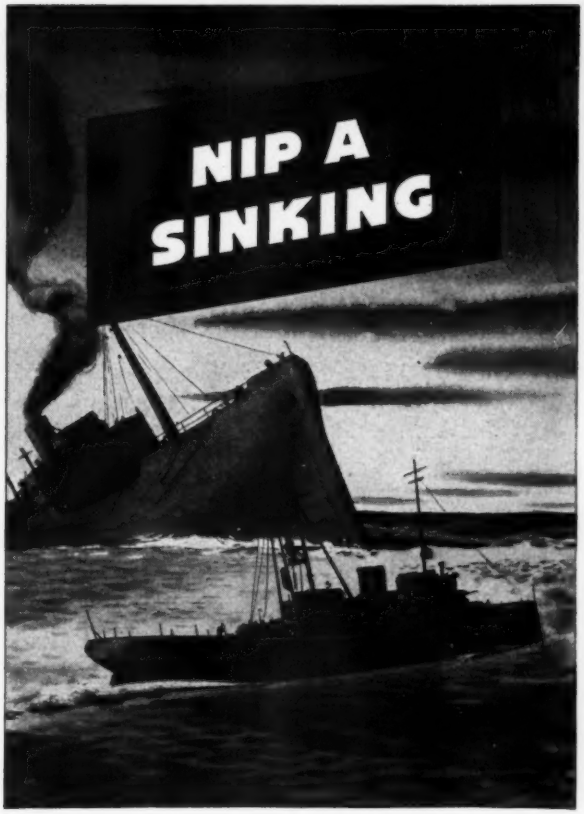
(*Continued from page 208*)

of the cycle is equivalent to swinging the dipper against an obstruction. This kind of operation must be avoided.

The foundation of any machine is the base or truck frame and the cats upon which it is mounted. These members are designed for maximum loads such as tipping the machine, digging in any position with stalling loads or swinging heavy loads at fast speeds. However, to operate the machine in this manner too frequently is applying high average loads too often which is, of course, bad practice. The result is that heavy concentrated loads on the rolling part of the cat will cause the material in these parts to compress and roll out and create a condition of poor mesh for the links and tumblers of this caterpillar mounting. Uneven ground, causing concentrations of the load on possibly three points in the cat has an equally bad effect. It is not hoped to have uniformly distributed loads on the cat at all times. It is expected, however, that for very uneven extremely hard floors that some measure should be taken to avoid having the machine rocking on three points under continuous operation. Constant pounding or peening of any metal surface will cause surface flow of the metal.

For the many conditions involved to obtain good efficiency of operation it is necessary to study them and effect a balance that would be beneficial to all functions. The shovel operator and the operating management must recognize the possibilities and limits of the shovel to get the most efficiency.





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Notes from the manufacturers

SKF Industries, Inc., Philadephia Pennsylvania, announces that William Loren Batt, president of the corporation and vice-chairman of the WPB has been awarded the Bok award, a medal and a $10,000 check for his service to the nation in leading industrial mobilization of the war, and as a citizen who performed the most distinguished service for Philadelphia in 1942. This is the twenty-first award since its inception by the late Edward W. Bok in 1921.

Cummins Engine Company, Columbus, Indiana, announces that C. L. Cummins, president of the firm has been appointed executive consultant on diesel engine production to the WPB with headquarters in Washington, D. C.

The company also announces several changes in executive personnel, two of them created by J. I. Miller, vice-president and general manager who accepted a commission as a lieutenant in the U. S. Naval Reserve. Succeeding Lt. Miller, now on active duty, is V. E. McMullen, former works manager. Carl R. Fox, former assistant works manager, was promoted to works manager.

Asphalt Institute, New York City, announces that at the annual meeting of the board of directors of the institute Bernard E. Gray was promoted to the position of general manager. Mr. Gray has been with the institute for the past 13 years, successively as highway engineer, chief highway engineer and chief engineer.

Hercules Powder Company, Wilmington, Delaware, has announced it will open sales offices in Boston, April 1, for its cellulose products, naval stores, synthetics, explosives and paper makers chemical departments. The offices are on the seventh floor of the Statler Building. Homer C. Simmons, New England manager of sales of the cellulose products department will head the new unit in Boston. Howard C. Bates, in charge of synthetics department sales for that territory, will be located in the Boston office.

Mack Trucks, Inc., Long Island, New York, announces the appointment of William S. Newell to the board of directors of the corporation. Mr. Newell is president of Todd-Bath Iron Shipbuilding Corporation and president of Bath Iron Works.

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Operator of 120-B electric shovels wishes work anywhere in North or South America. References. Now located near New York City. Box 9203

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Twenty years with one employer operating shovels and in charge of pit is experience offered by this applicant. Has operated Erie and Bucyrus-Erie shovels including Gas+Air. Available immediately because of shutdown brought on by war. Now located Illinois. Box 9204

New trade literature

Title: **"Stresses in Framed Structures"**
Subject: This book has been prepared for the use of the practicing engineer and also for the student who wishes to consult reference work which covers thoroughly modern civil engineering structures. The book is composed of 642 pages of technical information concerning bridge trusses, roof trusses, principles of statics, loads on structures and other vital data. Will aid greatly in the accurate calculation of stresses on all types of framed structures. Suitable for home study, class room instruction or general reference.
Where to Get: McGraw Hill Book Company, Inc., 330 West 42nd Street, New York, New York. Price $5.00.

Title: **"Pumperete Practice"**
Subject: This 164-page book is published for the convenience of contractors and engineers who are interested in piping concrete. It is designed to acquaint inexperienced pumperete users in a system that is relatively new, with fundamentals of sound and economic practice. It can also be used as a source of reference by any contractor. Each problem is profusely illustrated with photographs and diagrams. Chapters on placing costs and on distribution methods are included. Many types of structures are covered in the text.
Where to Get: Chain Belt Company, Milwaukee, Wisconsin. Ask for bulletin 422.

Title: **"Simplified Guide"**
Subject: How to select and apply motor control is explained in a new 16-page manual which presents the fundamentals of control in an interesting and suitable manner with many illustrations and explanatory diagrams.
Where to Get: General Electric Company, Schenectady, New York. Free upon request; ask for GEA-4015.

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